



**CONNECTING
ARIZONA TO THE
FUTURE**



Arizona Telecom Providers and Stakeholders

Request for Information (RFI)

Sponsored by

Arizona County Supervisor's Association
League of Arizona Cities and Towns
The Governor's Council on Innovation and Technology

February 15, 2005



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DISCLAIMERS

This RFI is issued solely for information and planning purposes only and does not constitute a solicitation. All information received in response to this RFI that is marked Proprietary will be handled accordingly. Responses to this RFI will not be returned. Responses to this RFI are not offers and cannot be accepted by Government entities to form a binding contract. Responders are solely responsible for all expenses associated with responding to this RFI.

CONTACT INFORMATION

Following is the Point of Contact (POC) for this RFI, including all correspondence for clarifications:

Mr. Galen Updike
(602) 364-4794
gupdike@azgita.gov
100 N. 15th Ave Suite 440
Phoenix, Arizona 85007

Please submit responses via e-mail in Microsoft Office format by **4:00 PM on March 31, 2005** to the POC at: **gupdike@azgita.gov**. You may also submit supplemental hardcopy materials such as brochures, etc. (5 copies each) to the POC.



INTRODUCTION

As a part of the Governor's Council on Innovation and Technology (GCIT), the Telecommunication Infrastructure Sub-Committee (TISC), in association with Government Information Technology Agency (GITA) and with the County Supervisor's Association (CSA), and League of Cities and Towns, is issuing a Request for Information (RFI) as a **FEASIBILITY STUDY** for possible future requests for the configuration, implementation, and ongoing management of a statewide Broadband Communications Network. The purpose of this RFI is to define minimum technical and functional requirements for the Arizona Broadband Communications Network and to obtain adequate budgetary estimates to evaluate and determine the need of infrastructure and service development for future consideration. The requested cost estimates are only to determine the feasibility of future projects.

Information provided will be provided to the Arizona State Procurement Office (SPO) with the intent that such information will bolster the SPO's understanding of rural Arizona's telecommunications needs as they prepare the request for proposals for the next generation of multi-year statewide carrier services contracts.

SCOPE

It is anticipated that Responses to this RFI will influence both the scope of and details within an RFP to be issued by the SPO which will likely result in one or more multi-year Carrier Service contracts. A significant intent of these multi-year carrier service contract(s) is to enable ALL public sector entities within the State of Arizona to procurement carrier services from a common procurement means such that aggregation goals and associated buyer and seller benefits can accrue. For purposes of this RFI, the term 'State' is used to define 'ALL public sector entities within the State of Arizona.'

TISC, County Supervisors Association and League of Cities and Towns, referred to herein as 'Requesters,' anticipate the creation of the Arizona Broadband Communications (ABC) Network which will consist of approximately 250 points of service around the state called *Aggregated Network Access Points* or ANAPs. An ANAP is not necessarily a physical presence or installation, but rather will be defined as a typical minimum of 100 Mbps of access capability for State network users in a given area. Communities of population 500 or less may only require an aggregate of 45 Mbps initially. High-speed network access will be delivered to all locations by the provider and distributed to users over appropriate links.

Responders are requested to identify how their existing service structure and planned improvements will meet the communications requirements of the ABC Network. This RFI seeks at least regional Prime contractor / Respondent(s), as defined in Arizona Department of Commerce's Economic Development Region divisions, who will create mutually beneficial public/private partnership(s)



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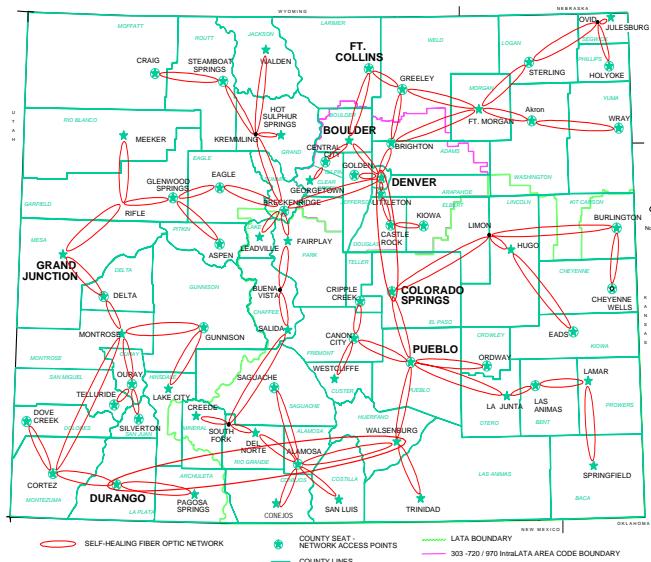
with the State as "anchor tenant" for increased communications performance and the extension of advanced technologies throughout Arizona. If appropriate, Regions may be consolidated into larger areas, including up to just one statewide region.

DESIRED OUTCOME

The Requestors desire to see combinations of Gigabit, 100 Mbps, and 10 Mbps capable broadband links, **all compliant with the Arizona Statewide Enterprise Architecture** (see GITA Website below) and capable of secure multi-media application transport.

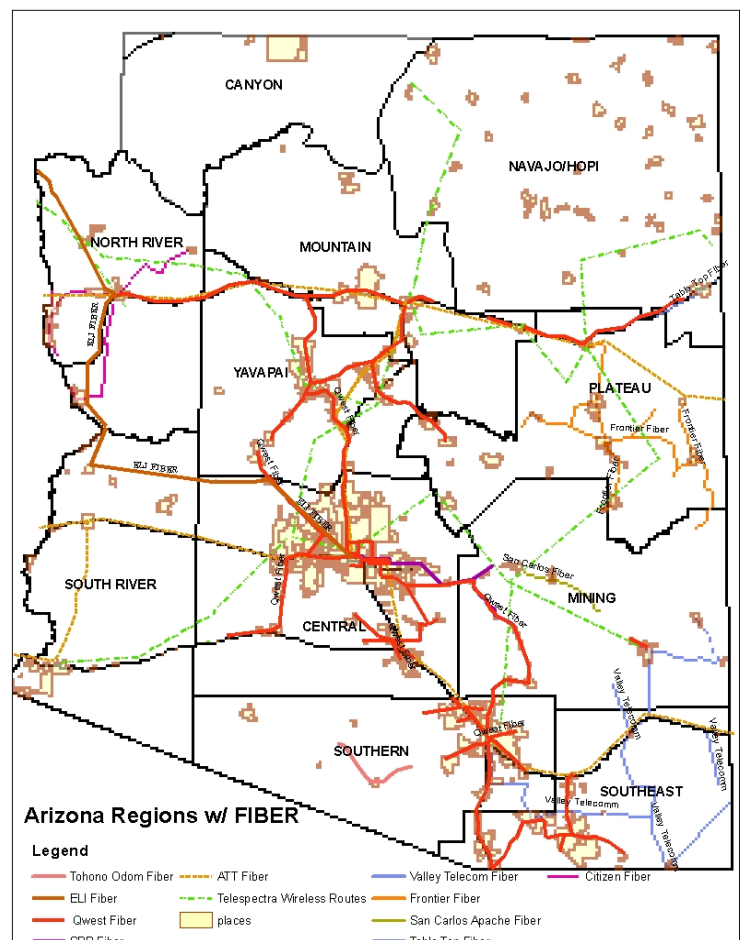
The Colorado MNT Project serves as a model for the distribution and locations of ANAPs indicated in this RFI.

Illustrated here is the resultant High Volume fiber loops to the County Seats from their 5 year effort.

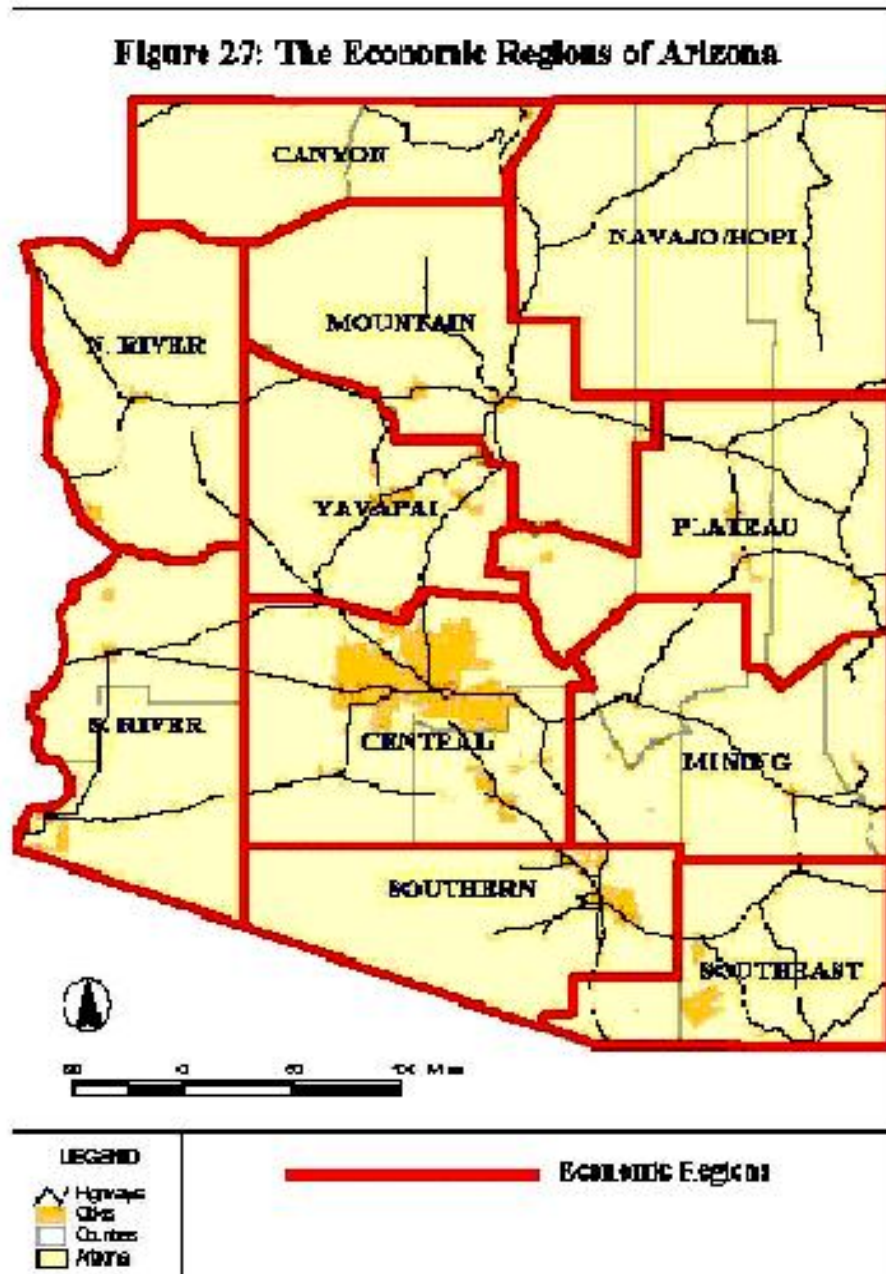


Note the “looping” and redundancy in Colorado and lack of looping in Arizona

Illustrated here is the current status of Arizona’s High Volume middle mile fiber.



Below is an illustration of the Regional alignment of the State per the Dept. of Commerce.





The RFI assumes the likelihood that by aggregating the telecom needs of the approximate 250 communities to within their respective regions; a favorable business model can be devised to include most of rural Arizona. A list of additional communities is also available for future expansion (see URL attachment below). The Requesters would look with favor if respondent's ABC Network design can also support broadband in those communities.

Goals and uses of this RFI include the following:

1. The primary goal of this RFI is to identify options that can provide direction to the State as it crafts an RFP for its telecommunication needs
2. To educate the Telecommunications Infrastructure Sub-Committee on possible solutions to statewide Telecommunication infrastructure problems. Respondents have free reign on how to provide the requested services.
3. To aggregate network management and communications purchasing to maximize the value of the State's communications investment in measures of cost efficiency and technical performance.
4. To define public/private partnerships which will enhance the communication capabilities throughout the state?
5. To identify how to provide a minimum of one point of service (ANAP) for high speed access to most communities in the state. An ANAP will provide a minimum bandwidth of 45 Mbps, capable of carrying voice, video, and data on a statewide network.
6. To create a communications service system in which the physical network may or may not be state owned. The network will likely consist of a network of purchased services with defined performance capabilities; and will be available to all consumers of broadband connectivity.
7. To align and aggregate all government purchases of communications services for efficiency and value of State investment (i.e., to receive the highest bandwidth and most reliable services for the available funds), coordinated management, and simplification of the vendor business relationship.
8. To leverage individual entity and State aggregate communications spending to assist vendor provision of broadband services in communities throughout Arizona.
9. To provide a secure, reliable, scaleable communications environment for the delivery of e-services.



The ABC Network concept involves the coordination of State communication services, WAN resources, existing state-owned equipment, and network management resources to generate cost savings, increased efficiency, and improved performance. The aggregation and coordination of State services should allow for the integration of all forms of communications traffic into a more cohesive and flexible network. The resulting services should be not only of higher performance, but also better availability, and potentially lower unit cost.

The Requesters desire that Respondents describe levels of cooperation and partnering requirements with government entities that will allow for rates are to be driven to their lowest levels consistence with rapid sustainable bandwidth availability and consumption. Respondents should scale levels of cooperation against rates and provide examples of how government can help lower rates. Plans could include tax breaks, right-of-way waivers, waivers for co-location of equipment, and others.

The Requesters desire to establish a statewide coordinated backbone network “cloud” based on broadband technology to carry voice, video, and data traffic in a fully interoperable environment. This backbone cloud is expected to be monitored and managed on a regional basis by regional operators on a 24 hour, seven day a week, 365 days a year (24 x 7 x 365) basis. Respondents must specify how their existing service structure and planned improvements will meet the communications requirements of the ABC Network.

This RFI seeks strategic partners who will assume responsibility as regional or statewide Prime Contractor(s) to create a mutually beneficial public/private partnership, with the State as "anchor tenant," for increased communications performance and the extension of advanced technologies throughout Arizona. The Requesters encourage the use of licensed, qualified, local subcontractors for implementation of the ABC Network where possible.

The Requesters suggest a 36 month baseline implementation schedule in which the ABC Network services are completed and are made available in 20% of sites in year one; 40% of sites in year two, and the remaining 40% of sites in year three . As an ANAP is established, the current communications services purchased by the Requesters in that area will be transferred, whenever possible, to access the newly established “cloud.” The Requesters also anticipate locating edge switches at points of high user demand. These edge switches will be included in the responsibilities of management and monitoring.

The core transport mechanism requested for the ABC, including fiber, fixed wireless, and a mix of various last mile technologies, is intended to support a wide variety of services and applications. The network traffic is fundamentally related to the ability of the network to provide appropriately differentiated Quality of Service (QOS) for network applications through an appropriate traffic contract and service categories. Each service category defines traffic contract parameters and QOS parameters. This is necessary for support of applications requiring different delay and loss performance such as voice, packet data (IP, FR), video, imaging, and circuit emulation.

Community-level aggregated demand is intended to provide the "anchor tenant" to defray the cost of "last mile," even in communities without significant State government communications



requirements. Local ANAPs (aggregations of non-State user requirements) will be formed within communities to aggregate communications services. The concept is to achieve a critical mass of demand and facilitate extension of the capabilities of the ABC Network.

At the end of this project the Requesters will have defined their current demands and combined their existing networks into a coordinated “cloud” extending its capabilities to every community throughout the State of Arizona.

GUIDING PRINCIPLES

Following are guiding principles and requirements to be accounted for in responses to the RFI (Robust responses are desired):

- Respondents should describe various levels of cooperation and partnering requirements with government entities necessary to optimize plans and to overcome problems (identify those problems). Respondents should scale levels of cooperation and provide examples of how a wide range of government involvement or policy changes can impact costs. Such examples could include the impact of tax breaks, right-of-way waivers, waivers for co-location of equipment, etc.
- Identify technology and appropriate costs to connect 13 outlying county seats with each other and with Phoenix and Tucson in a High Volume ring. Also include fiber or high volume wireless to connect 21 Tribal government headquarter communities into the ABC Network.
- Identify technology and appropriate estimated costs for a minimum of 45 Mbps into any town or unincorporated area of 500+ population (Approximately 250 locations).
- Identify technology appropriate to provide a minimum of 10 Mbps of (synchronous clear channel) transport to any political subdivision customer (School, School District, City Hall, County Agency, State Agency office, etc)
- Existing infrastructure, where feasible, may be taken into account in overall build-out plan to meet minimum requirement
- With State as an anchor tenant, identify technologies and appropriate estimated costs to provide various volumes of broadband connection (minimum 1 Mbps) to various non-government customers. (Suggest scenarios which include individual homes, subdivisions, HOA’s, individual businesses, aggregates of business like shopping centers, etc).
- Respondents should identify funding scenarios to help mitigate build-out costs, including community funding or community based grants (that is, revenue from other than State agency offices) to create additional opportunities and use of the ABC Network. It is expected that funding associated with community communications demand can be



aggregated from education, government, library, health care, and other public or non-profit sectors.

- Connectivity, in all cases, must be of sufficient quality for voice and data applications (Video a plus), must include Tier one connectivity
- Provider should identify various length of term vs. rate scenarios. (one year, three year, five year contracts, etc)
- Base any cost estimates on levels of aggregation (numbers of schools, schools & towns & fire districts, multiple towns, or multiple counties in an Economic Region, etc.) per the Commerce Department's division of the State into 11 regions.
- Preferred consideration given to plans which include regional aggregation.
- Statewide aggregation is not a requirement (such as a single maximum cost as was identified for the MNT plan in Colorado – see attached). However, it's a positive if a provider or group of providers can provide a statewide base rates for 10 Mbps minimum to all political entities and then scale those rates down with increased volume.
- Partnerships between providers are encouraged. Relationships should be identified (General Contractor, sub-contractors), especially at a regional level, including any ILEC or CLEC involvement.)
- Eventual contracts will be with single entities (grouping of partners or individual providers) at least for Regional contracts (Economic Regions as identified by the Arizona Department of Commerce). A Single Statewide contract may be considered if in best interest of State, as determined by the SPO.



RFI RESPONSE FORMAT

1. Conceptual ABC Network Alternatives Proposed

Briefly describe two or more alternative architecture concepts for ABC Network, including their reliability and availability characteristics. Discuss the capability for the architecture to expand to meet the guiding principles identified in this RFI. (3-5 pages per alternative with one diagram per alternative identifying the network elements that would typically be deployed). Provide any available or required middle mile resources for each alternative architecture concept.

2. Feasibility Assessment of Proposed ABC Network

Briefly describe the feasibility of each alternative and the community and regional tradeoffs involved to achieve the guiding principles identified in this RFI. (1-2 pages per alternative)

3. Cost Estimates, both Initial Costs and Operational Costs

Provide cost estimates for each alternative for 5 and 10-year life-cycles including non-recurring and annual recurring costs using the *Aggregated Network Access Points* (one page table). Also, discuss cost drivers, and potential cost tradeoffs (2-3 pages)

4. Schedule Estimates, Initial Build-out and Coordination with Existing Infrastructure

Provide schedule estimates for the development and deployment of each ABC Network alternative you identify (1-2 pages per alternative).

5. Respondent Expertise and Capabilities

Briefly describe your company, your products and services, history, ownership, financial information, and other information you deem relevant (no suggested page count)

In particular, please describe any projects you have been involved in that are similar in concept to what is described in this RFI, including development, management or operations approach, security requirements, and any relevant lessons learned (1-2 pages per project).

Include any comments on the structure of the requirements for a formal RFP response.

Note – please also describe any network capacity assets that you might be willing to utilize for deploying ABC Network. Examples of such assets might include unsold or unsubscribed capacities, so-called dark fiber routes, assets designated for liquidation or that are financially under-performing, etc.



6. Partnering and Coordination Concepts and Alternatives

Describe partnering and coordination concepts and alternatives that you believe should be considered as the ABC Network concept is pursued.

7. Additional Materials

Please provide any other materials, suggestions, and discussion you deem appropriate.



RESPONDENT RESOURCE MATERIALS

Resource Materials for Respondents to use for RFI

<http://www.azgita.gov/telecom/TISC/RFI/default.htm>

[List of Communities by Econ Region w URLs for RFI.xls](#)

List of Towns by Region, by population

Listing of URLs for town and/or Community demographic information

Community Telecom Assessment (CTA) Summaries or Regional Plan Summary by Region including

Northern Arizona Telecom Plan

[Northern Arizona 2004 Telecom Plan.pdf](#)

Acres-Parcomm Final Telecom Assessment (Near Statewide view)

[Final Telecom Assessment Report.pdf](#)

Yuma County Community Telecom Assessment

[Yuma_CTA_Report_FINAL.pdf](#)

Pinal – Gila County Community Telecom Assessment

[Gila Pinal County CTA Report FINAL.pdf](#)

Internet Linked source material:

GITA Standards and Enterprise Architecture

http://azgita.gov/enterprise_architecture/

Besides the above site, also look at http://www.azgita.gov/policies_standards/

And under P710 - S710 and P800 – S 830

Related GITA Links

<http://www.azgita.gov/telecom/TISC/RFI/default.htm>

Complete Community Assessments

Statewide ILEC territory Map

Regional Middle Mile Fiber Maps

Maps of Economic Development regions with associated Demographics



Following are summaries of the Community Telecommunication Assessments (CTA). For more complete information please visit the URL's associated with each Summary.

Northern Arizona (Three Regions, including Mountain, Navajo/Hopi, Canyon)

Excerpt from ACRES COMMUNITY ASSESSMENT REPORT PART 4 EXECUTIVE SUMMARY PAGES ES 1 - 3

Introduction

This Report presents the findings of the Community Telecommunications Assessment. In particular, it describes [1] existing and planned telecommunications capabilities and [2] telecommunications needs for the following study area:

- Flagstaff, Page, and Williams in Coconino County;
- the Hopi Tribe in Coconino County;
- the Navajo Nation in Coconino County;
- Page in Coconino County

Capabilities Assessment

Consultations were held with infrastructure and service providers with the potential to influence telecommunications services available within the study area. These consultations identified a number of important realities relating to transport and local access.

Of note, the existing capacity of digital transport routes to some communities is not sufficient to support additional broadband traffic volumes, and this is an important challenge they must overcome. Transport capacity constraints appear to be limiting telecommunications development in Sierra Vista, Safford and area, Show Low and area, Page, and Williams. Overcoming this transport capacity challenge could require market, regulatory, or public funding solutions, and these options should be considered in the Department of Commerce's forthcoming Broadband Technology Study given that they may also affect other communities in Arizona.

Some significant differences in the availability of broadband access services also exist among the communities in the study area. Two fundamental realities have become evident.

First, in terms of broadband access services, there tends to be a number of broadband opportunities within most communities. For example, many communities have some digital subscriber line and/or cable modem coverage, as well as availability of T1 connectivity. However, these opportunities are not universal. Services tend to be focused on the community cores, and residents and businesses in suburban and rural areas have fewer broadband options, or perhaps no options.



Second, other telecommunications issues beyond broadband connectivity are important in the communities. For example, a number of the communities within the study area have substantial basic telephone service and cellular telecommunications deficiencies that appear to be a detriment to economic growth. Challenges relating to the timely availability of T1 connectivity are also a major issue in some communities, stemming from the inadequacy of basic plant and transport.

Descriptions of the available infrastructure and services in each community are found in **Sections 4** through **10** of this Report.

Needs Assessment

Discussions were held with major telecommunications users in each study area (except within the Hopi and Navajo territories). Three over-arching findings resulted from these needs consultations.

First, telecommunications opportunities, and broadband in particular, are significantly greater than perceived within the community. The consultations identified that more options for broadband connectivity exist, and several communities do not significantly lag the rest of the world with respect to high-speed service availability (though, as described above, some gaps may occur outside the community cores). This “grass-is-greener” phenomenon is prevalent in many communities across North America.

Second, differences exist in the extent that end-user groups are served.

- In nearly all the consultations with public agencies, a high degree of satisfaction was expressed with current services. This may be due to the “clout” of those agencies and their revenues, ensuring that they receive priority treatment from service providers.
- Larger businesses often had the services they needed through wired or wireless means, but were sometimes concerned over the timely availability of T1 connectivity. Smaller firms are very much dependent on being near a wire center for DSL coverage, or being in an area served by a reliable wireless operator.
- A similar picture exists for citizens. Those in urban cores (e.g., Flagstaff, Parker, Show Low, Sierra Vista) may have access to one or more wired broadband service option, but those citizens outside the urban core tend to be limited to dial-up access.

Third, a missing piece of the puzzle in many communities is the availability of a local telecommunications “champion”. Experience shows that these champions can play an essential role in cultivating the demand for broadband services, spearheading funding applications in the form of grants from State and Federal bodies as well as not-for-profit donors, and in organizing efforts to dialogue with providers with the aim to secure infrastructure investments.



Looking to the Demand Side

An initial component included in the Community Telecommunications Assessment project plan was a “demand survey”. The demand surveys would identify the broadband services desired within each community, as well as the willingness-to-pay for those services. The ultimate intention of the surveys would be to attract the attention of service providers by demonstrating the presence of sufficient demand to support a business case for infrastructure and service extension.

Demand surveys were developed as part of this Community Telecommunications Assessment, though the demand survey approach has a number of limitations.

- *First*, the surveys might not help solve the transport capacity problems, since they are aimed at end-users and local access.
- *Second*, the surveys might not solve the local access problems in cases where providers do not see compelling business cases for investments in today’s cash-constrained industry.
- *Third*, a number of small, rural, and remote communities appear not to have the resources to implement the surveys, and may require assistance from the State in this respect.

It is important to consider these realities in future Phases of the Arizona Community Telecommunications Assessment program.



**FOR THE FULL REPORT, PLEASE REFER TO:
Northern Arizona (Three Regions, including Mountain, Navajo/Hopi, Canyon)**

Excerpt from GFEC Northern Arizona Telecommunications Plan - 2004

CHAPTER 9

Let's lay out the path we want to take ... or we may never get there.

The efforts described below are critical to Northern Arizonans, particularly to members of NACOG and the Alliance for the 2nd Century, in our collective pursuit of telecommunications capabilities in our communities that will offer affordable broadband and many other new service offerings to local residents. In earlier chapters, many of the options, along with impediments to those options have been discussed.

The tasks and milestones presented below must be viewed as a multi-path approach to improving telecommunications and services in Northern Arizona. The most critical task as mentioned in many other parts of this plan is addressing the sheer lack of middle-mile resources. The fiber and/or microwave systems that support these links are very high cost. So developing methods to fund those first is critical, since they must exist before broadband access inside a community can begin (or expand).

Federal Issues

A key issue relative to addressing any telecommunications issue must first give credence to the Federal regulatory body who administers national policy - i.e., the Federal Communications Commission (FCC). While the FCC was granted authority under the 1996 Telecom Act to administer all policy and regulatory (law) aspects of telecom services, their job has become increasingly difficult to manage largely because of the immense number

In spite of the enormous focus on establishing middle-mile resources throughout Northern Arizona, many other activities must be planned simultaneously that address local and regional issues. Flagstaff, as the lead City engaged in creating this “total approach,” is the most proactive in addressing the telecommunications foundation issues. Therefore, this Plan will address the actions that must be taken not only on a local basis, but at the State level as well. In fact, the actions at the State level are most critical, since they involve the creation of a (one or more) funding mechanism(s) for middle-mile *fiber* infrastructure that largely does not exist today.

This chapter will address actions that GFEC will be engaging in from a Federal, State, and Local (or more appropriately, *regional*) level in that respective order. A brief summary of the issue(s) that must be addressed, along with a recommended set of actions will be described taking into account the dynamic changes relative to each issue.

of legal suits initiated since the Act was passed. With limited budget and staff the FCC is under fire from virtually every direction, and it seems that many of the court battles and appeals are destined for Supreme Court rulings. Key battles are not expected to be formally settled anytime soon, and the industry as a whole is expected to be tied up for at least the next two years. The fallout effects will likely take another two or three. In any event, with the focus on broadband



in Arizona, the following key issues must be raised relative to Federal policies requiring revision if rural Arizonans ever expect to attain broadband parity with major metropolitan areas.

Restructure of FEDERAL Universal Service Fund (USF)

The USF has long been a vehicle imposed by the FCC to help establish a central funding mechanism to ensure that life-line telephony can be established in rural areas where service would not otherwise be provisioned by carriers because of a "business case."

USF funds are disbursed back to the states in the form of E-rate grant funding. Government entities like school districts or Indian reservations submit annual grant applications, and funding may be used for a variety of applications including computer acquisitions and upgrades, network implementations, and funds to offset the cost of broadband internet access. In effect, the USF is contributing to maintaining the high cost of internet access charged by carriers who cannot or will not install more capable fiber into rural areas.

Arizonans in recent years have contributed substantially more to the USF than they have gotten back in E-rate grants, which makes Arizona a "donor" state. In fact, approximately 40% of Arizona's USF contributions (which annually have exceeded \$100M) have been awarded to other states' E-rate recipients. The residual funding taken from Arizona could be used to construct badly needed middle mile fiber throughout Arizona, thereby enabling ubiquitous broadband to become a reality.

These rules need changed, and the timing to change them couldn't be better. With Sen. McCain chairing the U.S. Commerce Committee which oversees the FCC, a substantial legislative effort to push for restructuring of the USF is in order now.

Voice Over IP (VoIP) Regulation

The FCC, under the leadership of Michael Powell, has been openly vocal about the FCC's reluctance to impose any extensive regulation on VoIP. While VoIP has been classified as an "information service," many are beginning to argue that it should be treated like any other "voice" service. The rapid entry by cable companies to begin offering internet-based VoIP services is just beginning to steal business from telcos, who complain vehemently about being over-regulated and having to compete on an uneven playing field because "information" services are *not* regulated (i.e., *taxed*).

In the background, the nascent migration of telephony away from tradition copper to VoIP is beginning to pick up speed. Industry leaders are even predicting a wholesale migration to VoIP by the year 2010, which would lay waste to the customer base and revenues from today's "twisted pair" phone customers. Telcos are already losing customers and revenues at a rate of 10-12% per year.

While the monthly revenues are certainly important to telcos, more important are the taxes collected at the state level that make up a substantial portion of state budget revenues. Migration to VoIP without any taxable revenues will devastate state budgets over time. Hence, state representatives as well as telcos are now beginning to promote regulation of VoIP. Time will tell, but the FCC will likely be forced to bow to regulatory necessity. Many of the cost advantages of migrating to VoIP from the "consumer" perspective will be quenched as a result. In spite of regulation, there are other technical advantages to migrating to VoIP, and the movement is expected to continue.

Unbundled Network Element (UNE)



The 1996 Telecom Act prescribed a "formula" for establishing *competition* in the marketplace by mandating that incumbent providers make elements of their networks available to competitive providers. The "line of demarcation" for network entry by a competitor was established to be at the "unbundled network element," though no thorough definition was provided in the Act. For the last nearly eight years this lack of definition has resulted in massive litigation between incumbent and competitive providers, many of whom did not have the ability to survive the long court battle and have filed for bankruptcy.

The FCC was similarly budget limited, and attempted to pass on the task of defining UNE to state regulatory commissions, who also were ill equipped to accept such a task. U.S. District Court recently ruled that the FCC cannot delegate the task, further complicating this dubious responsibility. It is now estimated that acceptable resolution of the UNE litigation will not likely occur for another two years. As a result, those aspiring to break into the competitive market could fail like many before them.

RF Spectrum

Wireless solutions that serve both telephony and data needs continue to expand. However, wireless solutions require RF spectrum (a radio frequency and defined bandwidth) that is not susceptible to interference by other systems. The FCC is working diligently to reallocate radio spectrum and make "channel space" available to implement wireless new service solutions.

The mandate to migrate to digital television by 2005 will open some frequency bands to accommodate these new systems and services, but these frequencies are not without cost. In fact, these spectrum allocations are managed tightly by the FCC, and require significant up-front costs as well as license renewals on a periodic basis.

Next generation wireless systems that offer voice and/or data services (e.g., the 3G cellular networks), WiMax (802.16), Ultra Wideband (UWB), and others will all require dedicated RF spectrum to function. Some of these services will use licensed bands, some unlicensed so anyone may use them. Some will be implemented as point-to-point links, other as point-to-multipoint networks.

In any event, the FCC is struggling to identify how to best use RF spectrum to meet all the demands without impacting essential government, research and military system uses. While no direct and immediate action is required in this plan, it is of major interest because of the impact it may have to identifying solutions for rural Arizonans.



STATE

Through participation in the Arizona Telecommunications and Information Council (ATIC), GFEC recommends that Arizona adopt a strategy to accelerate deployment of advanced telecommunications services and affordable broadband Internet access throughout the State. These services are essential to the educational, economic and community development of Arizona's communities. Through initiatives such as TOPAZ, Community Telecom assessments, the Arizona Telemedicine Program and K-12 activities Arizona is progressing in broadband deployment, yet many of Arizona's communities still lack **affordable** broadband last-mile services such as cable modem, DSL, or fixed wireless.

In 2002 (the last year data was available) the Government Information Technology Agency (GITA) estimated that less than half of Arizona's 87 cities and towns with populations over 500 have broadband available. Of the cities that have services, many still face middle and last-mile deficits, and/or experience higher service costs, making it unaffordable to end users. These un-served or underserved communities often have the highest unemployment and poverty rates, they are most in need of economic revitalization, yet they lack the necessary economic development infrastructure. These telecom services are also often unavailable to residents and critical public services including education, health care and government. Therefore, these communities have limited access to new services such as distance learning, telemedicine and e-Government, and they experience a lesser quality of life and a difficult business environment.

THE PROBLEM – NEED FOR MIDDLE MILE DEPLOYMENT

There are two primary telecom services required to deploy broadband into a community – **Last Mile** and **Middle Mile**. The **Last Mile** is

the Internet connection between the Internet service provider (ISP) and businesses, homes, schools, etc. The **Middle Mile** is the high capacity trunk lines and associated infrastructure that connect communities to the Internet backbone points-of-presence generally in Phoenix and Tucson, and, in some cases, Albuquerque or Los Angeles. Last mile deployment of broadband is becoming more cost-effective, even in rural and underserved areas of the state with distributed populations. **A number of companies have expressed interest in providing last mile service in these areas, however, to deploy their networks and charge reasonable rates they must have access to sufficient and reasonably priced middle-mile connections.** There is an estimated \$80-\$150M requirement to address the middle-mile infrastructure deficiencies in Arizona. If a common middle mile infrastructure is not available, at reasonable rates, communities or last mile providers must construct their own middle mile infrastructure. This increases the last mile costs that can significantly increase the end users monthly rates.

Barriers to Middle Mile Deployment

1. **Return on Investment:** Broadband deployment requires a balance between deployment costs, "affordable" monthly end user rates, and the length of time for the provider's ROI, or Return on Investment. Today telecom providers are looking at an ROI requirement of 18 months - two years. Considering the cost of middle investment, this is often not a feasible model in rural and under served areas. Public and private organizations need some form of long term, low cost financing.
2. **Access to Rights-of-Way:** Federal, tribal, state and local Rights-of-Way issues such as multiple jurisdiction permitting, delayed

application approvals, and unequal and prohibitive fees have been significant barriers and disincentives for deployment of services.

3. **Planning and Coordination:** While there are a number telecom related initiatives underway in Arizona, there is no coordinated statewide strategy. Through coordination and planning Arizona would more effectively leverage existing resources and be eligible for millions of grant dollars to benefit community development.

RECOMMENDATIONS

Arizona needs to remove barriers and develop public policies and market-driven strategies that will encourage competition, private-sector investment in, and rapid deployment of advanced telecommunications services and affordable broadband Internet access throughout the State.

ATIC recommends the following initiatives:

1. Incorporate telecommunications as a critical infrastructure under GADA, the Greater Arizona Development Authority, in order to provide incentives for low cost, long term financing to encourage development of open and redundant, middle mile and last mile telecom solutions in the state.
2. Encourage the use of Project TOPAZ, the Telecommunications Open Partnerships for Arizona, to aggregate state and local government and private sector demand and procurement for telecom services.
3. Create an Arizona Telecommunications Planning Council that would produce a statewide telecom plan (incorporating regional plans), and facilitate coordination of the many statewide telecom infrastructure initiatives
4. Promote and support Regional/Community Telecommunications Assessments

5. Secure federal funding for telecom initiatives and provide state assistance to regions or communities of interest to identify, qualify, and apply for federal grants, subsidies and loans.
6. Expedite access to local, state, federal and tribal Rights of Way. Facilitate coordination and recommendations to expedite right of way permitting processes for last mile and middle mile inter-city/town transport.

INITIATIVE DETAILS

1. **GADA and Telecom Financing: Utilize the Greater Arizona Development Authority's (GADA) rule making authority to incorporate telecommunications as a critical infrastructure** in order to provide incentives for low cost, long term financing to encourage development of open and redundant, middle mile and last mile telecom solutions in the state. Where the law allows, owners of the network may be private, public or public/private partnerships. Networks using state or federal funds should be open on an equal basis to all.

Funding may come from sources such as nonprofit foundations, the federal or State Universal Service Funds, tax incentives, bonding, tribal gambling, E-rate, and other Federal programs including homeland security.

2. **Aggregate Demand and Procurement of Telecom Services:** Encourage the use of Project TOPAZ, the Telecommunications Open Partnerships for Arizona, to aggregate state and local government and private sector **demand** and **procurement** for telecom services. Topaz continues to be a primary vehicle to support public/private efforts to provision Rural Arizona with Broadband Infrastructure. As the State acts on behalf its own interests and in concert

with other communities of interest, to deploy Broadband infrastructure, its agents will be mindful of local community needs as well as its own. The State will establish and utilize standards for systems and reporting procedures that will facilitate demand and procurement aggregation by agencies and political subdivisions. The State will insist that before State Telecom dollars are spent, demand and procurement aggregation policy has been implemented. To do this, agencies and Political subdivisions, as well as Telecom providers which use State Contracts for carrier services will need to comply with all reporting requirements within those contracts. Entities which choose not to use State Contracts are encouraged to respond positively to Topaz as a Statewide policy, and work with regional and statewide councils to aggregate their Telecom needs. Procurement organizations would provide expertise for negotiating terms, prices and volume discounts, as well as commitments for increased deployment of broadband infrastructure. Subsequent agreements would then be forwarded to regional councils or Arizona Telecommunication Planning Council for monitoring.

3. **Statewide Telecom Planning and Coordination.** Create an Arizona Telecommunications Planning Council, ATPC, that would produce a statewide telecom plan and facilitate coordination of the many statewide telecom infrastructure initiatives such as TOPAZ, the School Facilities Board, Arizona Telemedicine Program, Universities and Community Colleges, NAUNET, SACCNet, CANAMEX Corridor, etc. The ATPC, along with Regional Councils, will provide the vision, framework and strategies for the development of a statewide telecom infrastructure. ATPC would be housed in

the Commerce Department and be appointed from within state Government and from the Public.

4. **Regional/Community Assessments:** Last year the Legislature appropriated \$500K to enable regions or “communities of interest” to conduct telecom assessments that would identify community telecom assets, define Telecom requirements, craft regional solutions and find funding mechanisms for those solutions. Appropriations and resources should be provided for additional community assessments. These assessments should be sourced from and directed by GADA. Smaller communities of interest may join together and aggregate demand and procurement within the eleven Economic Development Areas defined by the Arizona Department of Commerce. Outcomes of these assessments should be reported to responsible parties and incorporated into the statewide plan.
5. **Federal Funding:** The State of Arizona should provide resources to secure federal funding for telecom initiatives and provide state assistance to regions or communities of interest to identify, qualify, and apply for federal grants, subsidies and loans directed at both the public and private sector.

Arizona lags far behind other states in the acquisition of Federal grants, subsidies and loans for Broadband deployment. Currently, about \$8 Billion is earmarked nationally for Telecommunications subsidy and infrastructure deployment. Arizona’s annual fair share, based on population alone, should be in the \$200-\$250 Million range. Over the last 5 years, Arizona’s actual receipt from these programs is in the range of \$80 to \$120 Million annually. The State of Arizona needs to assist communities of interest in applying for these federal funds. The Arizona Telecommunication Planning



Council, and regional councils, can be key players in this effort. Before State or local funds are used, all federal funding opportunities should be explored. Emphasis should be placed on funds that develop open infrastructure.

Rights of Way: Expedite access to local, state, federal and tribal and Rights of Way. ATPC should facilitate coordination and development of recommendations for legislation and Executive directives to enable one-stop-shopping, consistent fees, and expedited right-of-way permitting processes for last mile and

middle mile inter-city/town transport. Every effort will be made to see that State owned Rights of Way will be made available for Broadband deployment. State of Arizona laws and Executive Orders regarding Rights of Way issues will be the primary source of policy. Other governmental organizations and political subdivisions are to be encouraged to allow Rights of Way under their jurisdictions to be utilized at little or no cost for Broadband deployment.

LOCAL - Northern Arizona

Key stakeholders in Northern Arizona - particularly the Flagstaff core group - face a number of challenges in establishing infrastructure and services that position them well to accommodate growth and economic development objectives.

The core group of stakeholders include:

- The City of Flagstaff
- Coconino County
- Northern Arizona University (NAU)
- Flagstaff Unified School District (FUSD)
- Coconino Community College
- The Navajo Nation
- The Hopi Nation
- The City of Page
- The City of Williams
- The City of Grand Canyon
- The City of Sedona
- Other lesser unincorporated cities/towns

A key issue which affects virtually all of these communities involves the sheer **lack of fiber infrastructure** upon which to ensure long-term telecommunications viability. While Flagstaff is reasonably well equipped with a fiber backbone to Phoenix, instances of fiber cuts have occurred causing multi-hour outages that affect

the whole northern region of the state. The Flagstaff Central Office acts as a hub to most northern Arizona communities' circuits, and the lack of redundant paths (failover circuits), any casualty to the Flagstaff-to-Phoenix fiber affects many cities.

Lack of redundancy is a primary objective GFEC will focus on as part of this plan. Efforts to date have resulted in the recent announcement by Qwest to install new fiber from Flagstaff to Winslow, where an existing fiber path to Albuquerque is in place but not currently lit. Completion of this connection would provide the basis for redundancy needed, and also provide a "reachable" fiber path for the improving telecommunications circuitry at the Navajo and Hopi reservations in the Northeast sector of the state. Barring no major complications, this new fiber lay may be completed by summer 2004. Long overdue.

Stakeholder Key Issues

The following table outlines key issues as discussed in consultations with IT directors of major stakeholders:



Stake Holder	Issue Description	Est. Cost	Who Invests	Priority Hi/Med/Lo
City of Flagstaff	a. Redundancy from Flagstaff b. Internet PoP in Flagstaff (\$30-50K/month recurring costs) c. Wireless user baseline in Flagstaff (\$8K)	\$6M \$600K \$8K	PI PI City	High High Med
Coconino County*	a. BB Internet to Munds/Kachina/Mtnaire/Winona b. Wireless Voice/data throughout county (requires infrastructure) c. Improved carrier infrastructure throughout county d. Fiber loop throughout Flagstaff – all key facilities e. Ability to get ISP services from Tier 1 providers	\$400K \$3M \$2M \$6M Negotiate	PI Joint PI City/County County	High High High High Med
NAU	a. Cost of local access links for 10K students b. Internet PoP in Flagstaff (~\$600K plus access recurring costs)	Negotiate \$600K	User PI	High Med
FUSD	a. Core router support (\$4K per year) b. Increase Bandwidth to schools - (\$300K/yr) c. Leupp connectivity (~\$50K + \$1K/month)	\$4K \$300K \$0K	FUSD FUSD FUSD	High Med Med
CCC	a. Broadband to Dine' building in Tuba City (\$5K + \$2K/month) b. Distance Learning Net (~\$2.5M + \$10K/month) c. Link costs and bandwidth alternatives (need 3-10 mbps) d. Internet PoP in Flagstaff	\$5K \$2.5M \$400K \$600K	CCC CCC/Grant PI PI	High Med Med Med
Library	a. Commspeed to Williams library (\$40 per month) b. Remote library accesses (OnSat? approximately \$1200/month) c. Fredonia broadband (service from XpressWeb in Knabb, UT) d. Internet PoP in Flagstaff	\$40/mo. \$1200/mo. \$100/mo. \$600K	Library Library Library PI	High High Med Med
Navajo Nation	a. Access to broadband trunks (~\$500K + \$10K/month) b. Schools/Chapter houses networked (~ from \$2M to \$8M....) c. Telemedicine net upgrade (~\$2M)	\$500K \$7M \$2M	Nation Nation/Grant Nation/Grant	High High High
Hopi Nation	a. Access to broadband trunks (~\$500K + \$10K/month) b. Telemedicine network upgrades (~\$1.2M) c. Create Hopi Telecom (~\$10M)	\$500K \$1.2M \$10M	Nation/Grant Nation/Grant Nation/Grant	High High High
City of Williams	a. Broadband Provider(s) (commspeed entry) b. Fiber access in the Central Office (~\$300K carrier invest) c. Cellular Coverage (carrier upgrades - ~\$450K/tower)	\$40/mo. \$300K \$450K	User PI PI	High High Med
City of Page	a. Access to broadband trunk (Qwest upgrade ~\$1.2M) b. Cost of broadband access (competitor entry once a. is done) c. Access to fiber (carrier invest - ~\$6.5M)	\$1.2M \$40/mo. \$6.5M	PI User PI	High High Med

PI = Provider (or “carrier”) investment is required rather than cost being imposed upon a stakeholder or user.

Two issues prevalent in the above table are:

1. Shortage or inadequacy of infrastructure (and resultant high costs), and
2. Unlicensed band wireless interference issues.



In addition, because of the extent of the impact, it is worthwhile expanding on the criticality of some of these issues in order to encourage immediate resolution.

City of Flagstaff. The City’s principal issues include the establishment of redundant central office capability to prevent multi-hour telecommunications outages in Northern Arizona, and the establishment of an internet Point of Presence (PoP) to reduce the cost of internet trunk charges that are usually “distance sensitive.” The cost of these upgrades are estimated at over \$6M largely because of the requirement for a major alternate-path fiber lay separate from the existing route to Phoenix. This added fiber would also create the potential for the installation of an internet PoP in Flagstaff if Return on Investment (ROI) goals of potential carriers is considered positive. This would reduce by 15-25% the cost of bulk internet services throughout the Northern Arizona area.

The other issues involved the growing use of unlicensed wireless systems in Flagstaff, and the inherent signal interference it causes as more and more users deploy these systems. Since they share the same frequency and sometimes “channel”, the effect is a significant increase in RF “noise” that these units must process and perform “error correction,” making the systems operate in a degraded (less than full rate) state. Knowing how many systems exist, where they are located, and what channel is being used by the operator helps minimize the impact on the City’s wireless operation. A spectral analysis would likely cost approximately \$8K.

Coconino County. The County is actively engaged in pursuing extensions of its existing broadband connections, and intends in the near future to press for improved carrier

infrastructure to serve not only the Flagstaff County functions in town, but also throughout the County as well. These are ambitious goals considering the cost of these infrastructure improvements and reluctance of carriers and providers to do them at their own expense. Estimates to provision fiber and/or microwave resources capable of establishing the County’s broadband network needs may easily cost \$10M or more depending on what partnerships might be arranged with the City and other stakeholders, or borne by carrier investments.

Once the primary trunks are in place, establishing a full-function wireless capability is feasible, but the trunk capacity must be pursued first. And establishing that trunk capacity to currently unserved areas of Munds Park, Kachina, Mountaineer and Winona in order to deliver a robust broadband capability in these areas. This can be accomplished using microwave trunks initially, but the eventual incorporation of more permanent fiber is essential for the long-term.

Typical costs for fiber lays for planning purposes are approximately:

- In-City: \$60K per mile
- Inter-City: \$25K per mile
- Aerial: \$12-20K per mile

not counting Right-of-Way (ROW) or recurring costs. In addition, the raw cost of fiber varies generally between \$1.50 to \$2.50 per foot depending on stand count.

Every opportunity to reduce ROW costs should be considered by both the City and County to help spawn a willingness by providers to provision.

Coconino Community College. CCC’s interest in extending its classware to remote facilities



throughout the County. All too often, the telecom resources are either unavailable or unaffordable. One alternative CCC has is to pursue grant opportunities that could create a microwave-based solution to establish this connectivity which could cost upwards of \$2.5M, or to monitor the activities of Qwest's (and other provider) upgrades that should permit the establishment of affordable local connections for these remote facilities.

Creation of an internet PoP is also a common interest with the City, County and others since it would further reduce the cost of bulk internet access that supports all CCC's locations.

FUSD. Two major issues exist within FUSD that deserve special consideration and immediate resolution. First, the lack of maintenance support for the core Cisco router that provides aggregate connectivity to the internet for all FUSD schools must be resolved as soon as possible. At this point, any hardware and/or software casualty this device should suffer would terminate all internet access to all schools. The estimated \$4000 per year needed to establish a maintenance contract should be diverted within existing school budget, and provided for in all future budget considerations.

A second and also pressing issue is that bandwidth provided by the State's School Facilities Board (SFB) contract calls for a single T1 into each school. Given the number of users who access the internet from many schools, a single T1 is not considered adequate. Accordingly, an ad hoc committee should be established to review bandwidth deficiencies, outline alternatives to upgrade current connectivity, and provide feedback to the SFB regarding increased requirements.

City and County Wireless. Both the City of Flagstaff and Coconino County make use of

unlicensed wireless radio systems to establish critical connectivity between two or more sites in Flagstaff. While the cost effectiveness and simplicity of using these systems demonstrate many advantages, the use of unlicensed spectrum-based systems brings with it the issue of "interference," since any number of users are permitted to use radios in the same frequency space (and channel). In addition, no user may be forced legally to stop interfering use. As a result, both City and County offices, as well as the library, have suffered heavy degradation to data circuits interconnecting local sites. In addition, the typical use of 802.11 (WiFi) equipment also presents an issue with security that warrants attention sometime soon.

It is recommended that near-term budget considerations attempt to identify either a licensed wireless technology, or land-line alternative. Next-generation 802.16 equipment will be entering the market later this year - in both licensed and unlicensed bands - that would eliminate the wireless fratricide currently experienced.

City of Williams. As a result of the GFEC Telecom project, the City of Williams is now provisioned with broadband service capability by the introduction of CommSpeed's wireless installation. Additional work is ongoing by Qwest to provision DSL within the City of Williams as well, and may begin service by the end of 2004. Between these two solutions, broadband will be available to local government as well as residents at an affordable price.

City of Page. The City of Page has long been plagued by being served by a trunk that extends from the City of Flagstaff's central office that is traffic-wise full. However, Qwest is in the midst of re-provisioning this trunk with equipment that is expected to triple the existing trunk capacity, and will have available the



excess bandwidth necessary to inaugurate broadband services from one or even more providers – using either wired or wireless offerings. This capacity should be in place in early 2005.

Navajo Nation. The Navajo are actively engaged in the development of plans to build their own network. The newly formed Navajo Telecom Regulatory Commission is in the midst of establishing policies and processes that should offer opportunities for broadband service introduction throughout the Navajo Nation, and realize the benefit of capturing access to broadband resources from a variety of points just outside the Nation's boundaries in an affordable. Long-term plans are being formulated also to develop a core fiber strategy that can support the Nation in its pursuit of economic development goals.

Hopi Nation. The Hopi Nation is actively engaged in taking control of their own broadband destiny through the creation of its own municipal utility called Hopi Telecommunications. In coming months, decisions will be made whether to acquire the capital assets of the existing CenturyTel provider as the foundation for this utility, or to build largely from scratch a Hopi-wide network that can provide the broadband service capacity for their future.



A summary of GFEC’s principal thrusts and approximate timeframes are outlined in the following table.

QTR/ YEAR	STATE	LOCAL	OTHER
2Q04	<ol style="list-style-type: none"> 1. Establish process within GADA for telecom project bonding. 2. Schedule briefings to communities on GADA process - emphasizing regional cooperation. 3. ATIC participation; develop additional legislative proposals to expand middle-mile funding sources within GADA as part of Joint Legislative Committee on Telecommunications (JLCT). 4. Support development of a universal briefing to communities to discuss broadband development alternatives. 	<ol style="list-style-type: none"> 1. Assist as requested with airport fiber ring project. 2. Publish Telecom Plan for all key stakeholders for review and comment. Finalize. 3. Assist Qwest with gaining right-of-way approval on the Navajo Nation for use of Preston Mesa/Jack's Peak microwave upgrade from DS-3 to OC-3 connectivity to Page. 4. Coordinate with CCC on holding a regular “Telecom Seminar” Flagstaff 5. Active involvement in Rough Rock School District upgrade plans to bring establish VoIP system to Navajo reservation (Optegra-Lockheed Martin). 6. Host discussions with AT&T and Telespectra regarding installation of internet access PoP in Flagstaff central office. 6. Community briefings. 	<ol style="list-style-type: none"> 1. Review key stakeholder needs, issues and potential requirements changes for incorporation into long-term plans. 2. Host follow-on meeting with Qwest to address redundancy issues and impacts incurred during Jan 9 and July 9 outages. 3. Investigate in detail the use of 802.16 wireless broadband technology and develop report and brief. 4. When/if tasked, provide IT consultant services to City of Flagstaff to assist building long term IT plan. 6. Outline telecom overview for Navajo Infrastructure conference in Farmington NM - May 11/12 7. Participate in Navajo Telecom Regulatory Commission meetings as requested.



QTR/ YEAR	STATE	LOCAL	OTHER
3Q04	<ol style="list-style-type: none"> 1. Pursue additional ADOC CTA opportunity for work not completed by initial CTA (wireless baseline?) 2. Assist with definition of Broadband Service Fund as part of JLCT. 3. Assist with legislative efforts to expand GADA role as a bond authority for telecom infrastructure. 4. Assist GITA with further development of the rural telecom plans and policy. 5. Assist ACC with suggestions on policy to separate commercial and wholesale elements of ILECs. 6. Governor's Rural Development Conference 	<ol style="list-style-type: none"> 1. Continue to assist as needed with Airpark fiber project. 2. Engage with and encourage at least 3 new potential providers of services in Northern AZ. 3. Continue ATIC board support in formulation of strategy and policy for Northern AZ. 4. Telecommunications and Networking Seminar at CCC. Primary focus - wireless technologies. 5. Work with Optegra to define solution for wireless expansion for Navajo/Hopi. 6. Support briefings to the Arizona ITA. 7. Community briefings. 	<ol style="list-style-type: none"> 1. Meet with candidate competitive service providers formulating a telco hotel strategy in Flagstaff. 2. Begin project to evaluate and document use of unlicensed wireless spectrum in Flagstaff to use as a baseline for new service providers. 3. Evaluate new opportunities for competitive (lower cost) service to N. AZ communities. 4. Participate in Navajo Telecom Regulatory Commission meetings as requested. 5. Review and build updates for 2005 issue of Telecom Plan.
4Q04	<ol style="list-style-type: none"> 1. Coordinate infrastructure installation priorities for N. AZ 2. Address access costs of infrastructure to support telemedicine and distance learning (CCC & NAU) 3. Work with GITA on updating critical infrastructure maps of AZ. 	<ol style="list-style-type: none"> 1. Revisit possibilities for City to consider Traffic Signal upgrade.. 2. Coordinate expansion of DSL to gapped areas in Flagstaff. 3. Continue discussions with CableVision regarding provisioning Airpark fiber. 4. Create web-based version of Telecom Plan. 5. Community briefings. 	<ol style="list-style-type: none"> 1. Coordinate with existing and new providers for VoIP entry into N. AZ market. 2. Formulate business model strategy for Telco Hotel. 3. Review new Federal mandates and opportunities for funding and expanding critical infrastructure. 4. Review and build updates for 2005 issue of Telecom Plan

QTR/ YEAR	STATE	LOCAL	OTHER
1Q05	<ol style="list-style-type: none"> 1. ATIC board - assist with State-wide telecom plan. 2. Assist GITA/ACC as needed in refining policies and plans for rural broadband initiatives. 	<ol style="list-style-type: none"> 1. Update the N AZ Telecom Plan and redistribute to stakeholders. 2. Provide "Where we are" update to stakeholders. 	<ol style="list-style-type: none"> 1. ILEC and competitive provider discussions on creating Service Level Agreements. 2. Coordinate service aggregation strategy
2Q05	<ol style="list-style-type: none"> 1. Review status of State agency Broadband activities. 2. Provide "Where we are" feedback presentation to GITA and ADOC. 	<ol style="list-style-type: none"> 1. CableVision fiber to alt entrance to airport. 2. Review overall networks of City & County and discuss ways to reduce cost / increase capabilities. 	<ol style="list-style-type: none"> 1. Engage with providers on VoIP offerings for Flagstaff businesses. 2. Review and build updates for 2006 issue of Telecom Plan.
3Q05	<ol style="list-style-type: none"> 1. Review status of legislation and ongoing projects for impacts and/or follow on activities in N. AZ. 	<ol style="list-style-type: none"> 1. Baseline successes, and identify gapfill requirements for incorporation into updated Plan. 	<ol style="list-style-type: none"> 1. Engage key stakeholders; identify critical issues and incorporate into Telecom Plan update
4Q05	Under development	Under development	Under development
1Q06	Under development	Under development	Under development

Recent Accomplishments:

- CommSpeed's wireless MMDS service initiation in Flagstaff (including both residential and business access - offering residents double the speed of existing cable and DSL offerings at saving of \$10-\$15 per month)
- Initiation of discussions with AT&T and Telespectra (potentially, other carriers) regarding installation of a primary internet access Point of Presence (PoP) in the Flagstaff Central Office. Once completed, business and government subscribers will be able to significantly reduce broadband access costs by eliminating the "distance-sensitive" trunk charges currently applied by carriers to transport internet traffic to the PoP in Phoenix.
- Enticement of Qwest to begin installation of fiber from Flagstaff to Winslow.
- Expansion of CommSpeed network to include high speed business class wireless access in Flagstaff, and expansion into Williams.



- Evaluation of service options between W.L. Gore campuses that - once complete - will result in savings exceeding \$100K per year.
- Recent expansion of Qwest DSL offering into Doney Park and North Flagstaff.
- Wrote GADA legislation establishing the foundation for funding middle-mile infrastructure to Arizona rural communities.
- Provide inputs for City leaders for Washington visit, addressing need for restructure of USF funding.
- Assist with selection of County IT Director.

SUMMARY

Key elements of near-term GFEC work are intended to focus on ways to resolve the following critical issues first:

- Establish funding mechanism for broadband infrastructure throughout Northern Arizona.
- Resolve longstanding redundancy issue in trunks between Phoenix and Flagstaff.
- Provide direct support to the Alliance and community stakeholders on telecom and network-related issues
- Support development of the Fiber Ring at the Airpark. (Use wireless broadband as an interim support method).
- Continue to pursue the entry of alternative (read: *competitive*) providers into Flagstaff and other Northern Arizona communities as a means of keeping costs down.
- Move forward with concepts that aggregate services for key businesses and telecom consumers in Northern Arizona as a means of minimizing broadband access costs while maximizing broadband capabilities.
- Exploit developments in Voice Over IP technologies and providers as a means of establishing service offering(s) for VoIP in Flagstaff (and potentially other communities).



YUMA County - Community Telecom Assessment
EXCERPT from Final Report. Section 10
(For complete report see [this Link](#):
Current Technology/Telecom Needs

COUNTY

Yuma County covers a geographic territory of 5,522 square miles with a majority of the land mass incorporating an arid desert environment with elevations ranging from 100 feet to 1,000 feet in the numerous rugged mountains that dot the landscape. Primary economic drivers for Yuma County include agriculture, tourism, government, and the military industry. In spite of its large geographic boundaries, only about a 10th of the land mass is privately owned (10.5% of the land is owned by corporations or individuals).

The City of Yuma is the county seat and is located in the southwest corner of the county, central to the other 3 incorporated cities and towns in Yuma County. Yuma is also the largest population center in the county. The majority of the county's population is concentrated in the geographic corridor that runs between Wellton in the south central portion of Yuma County, on I-8, west through Yuma and then south on the Highway 95 corridor that encompasses Somerton and San Luis (which is directly on the U.S.-Mexico border).



Yuma County is home to additional, much smaller settlements that are not incorporated and have extremely limited government services. Those communities include Gadsden in the south between Somerton and San Luis, and Tacna, Roll, Dateland and Aztec which all lie to the east of Wellton on the I-8 corridor. There is also a very large and rapidly growing development on the eastern limits of the City of Yuma, an area called the Foothills, which lies at the base of the western slope of the Gila Mountains.

Yuma County enjoys a robust network, employing multiple T-1s, SDSL and a gigabit Ethernet for the county's local and wide area network in Yuma (the city). The county does employ GIS and maintains a strong web presence. It has plans to expand its active use of this technology, intending to create an interactive web interface for its citizens' benefit, as well as increased access to state and federal data bases.

The County's Community Development Department is advanced in its grasp of technological capabilities and is very keen to capture the economies that such technology can provide to a sophisticated and well-run operation. The County also has the benefit of a well-trained and sizable IT support staff which stays well ahead of the technology needs of the county's departments and administration. Existing networks, projects, and contracts can be characterized as adequate and redundant, and the County should certainly consider this a tremendous asset. Current broadband usage is very high and future demand is anticipated to continue to be very



high. The deployment of these new applications is proof that the need for additional bandwidth is inevitable.

CITIES/TOWNS/COMMUNITIES/TRIBAL RESERVATIONS

Yuma

The City of Yuma serves as the county seat of Yuma County and is the site of a major military installation, the Yuma Marine Corp Air Station. Yuma is located just below the confluence of the Colorado and Gila Rivers, and the site has been recognized since prehistoric times as a preferred location for crossing the mighty Colorado River into what is now California.

Agriculture is the major employer in Yuma followed by government (all levels) and the service sector (medical, professional, and tourism related). Yuma's location in the deep southwest corner of Arizona establishes it as a major port of entry between Mexico and the U.S. as well as a significant hub on the I-8 transportation corridor between San Diego, California and Casa Grande, Arizona and the intersection with I-10. In 2003, Yuma was listed as the 3rd fastest growing city in the United States.

Qwest Communications is the area local exchange carrier and does have fiber optic cable in the city, as well as digital switching capacity. Adelphia is the cable service provider and is providing digital cable service. There are numerous internet service providers in Yuma, ranging from cable to DSL to wireless services.

The City of Yuma maintains an extensive data communications system networked out of its newly constructed city hall. It has recently invested in new network infrastructure and has plans to deploy a citywide fiber network to support an "Intelligent Traffic System." The city has deployed various network topologies to support the city's needs over the past several years. The network consists of a combination of T-1's, ISDN circuits, wireless networks, TCP/IP circuits and VoIP for voice communications. Like the County, the City of Yuma enjoys the advantages of a forward-thinking, sophisticated IT team that manages an extensive network for the benefit of the community. This department has already captured significant cost savings through the employment of VoIP technologies and has plans to expand cost-savings technologies on an even broader basis. Existing bandwidth demands for the City of Yuma are already very high and are anticipated to remain so, and even increase, in the foreseeable future.

MCAS Yuma has cable service from Adelphia serving approximately 2300 billable addresses. The service coverage includes cable TV and broadband for the base housing and barracks. Qwest is positioned to deploy DSL to the same service area on the Air Station by mid- to late February, 2004.



San Luis

This rapidly growing community is a short 20 miles south of the City of Yuma. San Luis is the site of a large international border crossing. Its sister city, San Luis Rio Colorado is in Sonora, Mexico and has a population of over 200,000. The Town of San Luis has experienced exponential growth with the population rapidly increasing from 4,212 in 1990 to an estimated 19,764 in 2003.

Surrounded by very highly productive agricultural lands, San Luis enjoys an economic boost from light industry that serves both sides of the border. There is active development of a 40 acre industrial park and 40 acre commercial development on the state highway 95 frontage in the northern section of San Luis. A major expansion of the border crossing is planned to accommodate the significant increase in demand for transportation of products across the border between the U.S. and Mexico.

Local exchange service is provided by Qwest Communications, Adelphia provides cable television service, and BeamSpeed offers wireless internet access in the community. Access to fiber optic cable does not yet exist and the local switch is not digital (the PSAP is located in Somerton, 14 miles to the north). The city does maintain a local area network in the city hall as well as a wireless wide area network to some, but not all, of its external city sites. The city does not use GIS, depending instead on aerial photography for planning purposes. However, there is recognition that digital applications for planning purposes in the near term are an important tool for the city, especially in the face of such rapid growth and development.

The police department currently has direct access to the ACEGIS and NCIC databases, but would like to have broadband digital access, especially since both databases are scheduled to go digital by 2005. With its location on the international border with Mexico, San Luis recognizes that Homeland Security is extremely important and cutting edge technology will be required to meet security demands.

The economic development community in San Luis, and at least a few of its businesses, recognize the need for enhanced access to broadband technology, especially given their efforts to attract and locate intensive manufacturing and assembly plants to the area. Current technology applications and bandwidth demands are deemed to be moderate, but it is anticipated that in the very near future, bandwidth demands in San Luis will rocket into the high demand category.

Somerton

Located just 10 miles south of Yuma, on state highway 95, Somerton is a small, agriculturally oriented community. Its location is the same distance from the Mexico border as it is from the California border. Like the rest of the southwest region of Yuma County, Somerton is experiencing significant growth and just recently undertook an ambitious annexation endeavor. This community has recently added an elementary and middle school as well as some new retail development.



Qwest Communications is the local exchange carrier and Adelphia is the cable television supplier. DSL and cable modem service are not currently available in Somerton. The city hall does have a local area network, as does the police department, but there is no wide area network capability to the outlying city offices like parks and recreation or the fire department. The police department does not have laptops in the cars, nor are there any plans in the near term to equip them with that capacity.

The city hall used to have a T-1 connection for internet access, but its private sector IT consultant recommended ending that service and switching to a wireless connection to the internet via BeamSpeed in order to save the city money. External departments have a shared dial-up access to the internet, but it can only be used by one computer at a time. The town engineer prefers to maintain mapping records in AutoCAD drawings, but the city manager recognizes there would be benefits in migrating to a GIS-based system, especially with the planned annexation. The city is currently exploring having its sewer system migrated to GIS and has ArcView software installed.

The city does not maintain a webpage and does not have capacity to provide for that avenue of citizen access. The city manager did indicate that the residents of Somerton did value technology, and that many families made the financial sacrifice required to obtain computers and internet access for their children. Current bandwidth demand is considered to be low, but it is anticipated to increase in the short term to at least the moderate level, and perhaps even into the higher demand category in the longer term.

Wellton

This idyllic agrarian community is located 29 miles east of Yuma, on I-8 on the east slope of Telegraph Pass and in the scenic and fertile Mohawk Valley. Incorporated in 1970, Wellton combines a long-standing history in ranching, agriculture, and water with a more recent phenomenon of serving as a winter resort and retirement community. The area's mild winters and year-round growing season (and golf season) make it a new and highly desirable destination for the winter snowbirds from up north. There is a small, but growing retail sector in Wellton. While agriculture remains the largest economic driver and employer, energy development interests and manufacturing may be positioning themselves to exert a new economic influence on Wellton and its neighbors.

Telespectra was recently awarded a \$1.3 million dollar grant for their plan for Wellton from USDA to provide broadband wireless internet access to the community. Facilities that now have high speed wireless internet access in Wellton are:

- Wellton Library/Community Center
- Wellton Police Department
- Yuma County Sheriff Sub-Station
- Wellton Elementary School
- Antelope Union High School



- East County School Healthcare Center
- Arizona Western Farm Service
- McElhaney Cattle Company
- Wellton Mohawk Irrigation

See Appendix H for additional information about Telespectra.

Wellton is just starting to understand and capture the opportunities that such accessibility offers, and is working steadily to harness the benefits. The police department would like to equip its patrol cars with laptops to access the NCIC database in real time. The fire department is interested in GPS and GSD applications for real time access to information on haz-mat locations and other resource databases.

The town does have GIS capability through its designated town engineer, who is based in Yuma. There is concern and frustration with its proprietary software developer because the financial software packages currently available are not oriented toward small, rural community financial needs and technical assistance is remotely located. The town maintains a web presence, but there is no designated IT position on town staff, a shortcoming that the town would like to address but encounters financial limitations to do so.

Because Wellton is just starting to employ the technologies that demand broadband access, and given that it currently has wireless broadband access through a USDA-funded demonstration project, the current bandwidth demands are considered to be moderate. However, with the rapid development of a 500 unit planned unit development on its southern flank, and an additional 1500 units potential, this community's demand will likely leap into the high demand category in the near future.

Cocopah Reservation

The Cocopah Indian Reservation is a network of three tribal locations that total almost 8,000 acres. Established by a Presidential Executive Order by Woodrow Wilson in 1917, the reservation land mass was increased by Congress in 1985. There is an east and west reservation, as well as the newer, north reservation. The tribe just recently completed the construction of a new casino on state highway 95, replacing an older, smaller version in a neighboring location. The north reservation hosts a golf course resort and is a favorite destination of winter snowbirds. Agriculture remains a major economic sector for the tribe, with large tracts of irrigated agriculture leased to corporate interests. Income from agricultural leases provides a level of income secondary to the casino revenues and golf resort revenues.

The unemployment rate for 2000 was 13.2%, a very low figure compared to other reservation statistics, but the 2002 estimated unemployment figure has risen to 18.7%. The Cocopah Tribe has been recognized for its ground-breaking intergovernmental agreement on mutual aid fire protection with the City of Somerton which borders the west and east reservations. The tribe is a member of the Yuma Metro Planning Organization and has participated in the Area Service Highways project which runs from Yuma to the border.



Qwest Communications is the local exchange carrier. The tribal administrator has indicated that service quality is not good and there is a need for expanded access for the casino, which currently has 2 T-1s in service, one for voice and one for data purposes. Adelphia has installed fiber to the golf resort on the north reservation, but has not extended service to the west and east reservations, stopping just short of the casino location on the east reservation. The casino is currently using satellite access for television service.

Internet access is available from Cochise Internet and Sierra Vista but DSL and cable modem service are not available. In 1995, the tribal council authorized the purchase of new computers. Since that time, a plan has been developed to obtain 200 state-of-the art computer modules with a refresh rate of 3 years. The tribal administrator, who has a background in IT, clearly is cognizant of the importance of technology for the future of the tribe. There is interest in educational, cultural, environmental, and health-related applications using broadband access. At the current time, there is low demand for bandwidth, but that demand is expected to increase in the near future with the addition of the new casino and other tribal plans, to the high demand category.

EDUCATIONAL

K-12

No other market segment has had the price subsidy support and statewide design assistance that K-12 schools have had. Two key factors in recent development of the K-12 network infrastructure are:

- Federal E-rate subsidy support for telecommunications services, internet connectivity, and internal connections (such as routers); and
- The Arizona School Facilities Board's Students FIRST program which upgraded network technology to provide school LANs and district WANs that aggregate school district internet access to a single broadband connection point, called a District Aggregation Point, or DAP

"The Internet use for email and communications by students and staff is increasing at a fantastic rate. Within two years, over 2,000 users a day will be accessing the internet through our network."
Gadsden Elementary School District #32

In most rural communities the school is often the only user of higher-bandwidth connectivity, but even in their larger, more urban communities, it may be the first place residents are exposed to advanced network applications and higher bandwidth services.

Typically, network development planning encourages just the sort of district-level aggregation that has already been achieved in Arizona via the Students FIRST initiative. Connectivity to the Students FIRST program's minimum standards (established in May of 2000) was reported completed as of June 30, 2003, so connectivity goals can be said to have been met. [No summary project report or individual county data was available from the Arizona School Facilities Board. A public information request for individual district information identifying district aggregation points (DAPs) was pending as of February 10, 2004.]



The definition of "broadband," however, may still be subject to local limitations. One Yuma County town – Dateland – was unable to get a T-1 circuit for its schools from its local independent telephone company, the Arizona Telephone Company (a TDS company), and has had to resort to satellite connectivity. The satellite connection is at T-1 bandwidth, but appears to have some performance problems due to latency issues.

Interviews with district representatives report few performance issues, and a general sense of adequacy with current bandwidth investments (typically T-1). However, as schools begin to sample more advanced applications such as online interactive IP video distance learning, streaming video and online multimedia courseware, a T-1 connection will begin to seem less than adequate.

E-rate

A survey of E-rate funding and the potential impacts of upcoming changes in the E-rate subsidy program that resulted from recent fraud and abuse investigations will be completed in the next phase of the CTA process.

Students FIRST

Students FIRST (Eair and ImmEDIATE Resources for Students Today) is the popular name of legislation enacted to resolve a court-ordered requirement to develop a constitutional system of school capital finance to address inequities in Arizona's existing school funding system. That system, based on a secondary property tax and limited by the property wealth of a school district, had been declared unconstitutional in 1994 because it failed to conform to the state constitution's "general and uniform" clause. The complete text of the Student FIRST legislation is at <http://www.azleg.state.az.us/legtext/43leg/3s/bills/sb1002p.pdf>. After a four-year legal and legislative battle, the legislation establishing Students FIRST was signed on July 9, 1988, creating a School Facilities Board (SFB) to administer the program.

Strictly defined as a school capital finance program, Students FIRST is funded by revenues dedicated from the state transaction privilege (sales) tax. Through the School Facilities Board, public school districts in Arizona received funding for the correction of deficiencies in existing school facilities, building renewal, and new school construction, while continuing to have the ability to raise local funds through limited general obligation bonding and capital overrides. The primary goal of Students FIRST is remediation and equity.

One of the purposes of StudentsFIRST was called "Deficiencies Correction" – upgrading existing schools to defined minimum standards. The Students FIRST law established a deficiencies correction fund for the purpose of correcting deficiencies in existing school facilities. Deficiencies might take the form of a square footage deficiency or a quality deficiency, and had to be corrected by June 30, 2003. The School Facilities Board is charged with adopting rules establishing minimum school facility guidelines, assessing school buildings against these guidelines, and providing monies to bring the buildings up to the guidelines. On November 18,



1999, the Board adopted Building Adequacy Guidelines that now serve as the minimum standards for existing and new school facilities in Arizona.

SFB Technology Initiatives derive also from its task of deficiencies correction. The Students FIRST law also required the School Facilities Board to address technology adequacy in Arizona schools. The SFB adopted a three-part plan to address educational technology. The plan included bringing the computer to student ratio to 1:8 in every district, networking and internet connectivity, and a providing a common, centralized application service provider.

Computers

One of the first steps in SFB's technology initiatives was the purchase, in 2000, of more than 36,000 computers for public school districts at a cost of \$44.2 million. These computers were classed at the time of their purchase as multimedia workstations equipped at a minimum with Pentium III 600 MHz Intel processors with Windows 98, NT, or 2000, or Apple 350 processors with OZ9. Each also was equipped with a minimum of 64 Mb of RAM and 20X CD ROM drives and network capability.

The computer distribution that initiated the SBF technology initiative happened so long ago that these machines must be considered, for all practical purposes, obsolete.

Network and Internet Connectivity

In February of 2001 the SFB approved a \$100 million networking and internet connectivity project that was intended to substantially improve and support "state-of-the art networking technology to the desktop." The project was to connect all network capable computers in every school to a local area network (LAN). All schools within a district would be aggregated into a wide area network (WAN) that provides a single district aggregation point for broadband connectivity to the internet. The internet and LAN structure is required to be capable of supporting a converged network (voice, video, and data to each networked computer). The district network infrastructures include 100Mbps (expandable to one Gigabit) Ethernet connectivity to the classroom and 10/100 Mbps of connectivity to each networked computer. Installed project hardware includes switches and routers, cache engines, and content managers. Filtering software and firewalls are also included. The project was originally scheduled to be completed by summer 2002.

Original SFB Network and Internet Connectivity standards (annotated with an amendment), as published in an SFB FAQ, were:

"...the minimum objectives are to provide the following:

- Internet connectivity to all instructional areas in all public schools
- 100 Mb connectivity to all instructional areas, expandable to 1 Gigabit (expansion may require additional equipment purchases by the district)
- 100 Mb connectivity to each networkable computer both in instructional areas and any other non-instructional areas that have networkable computers; e.g., administrative areas



- Filtering software and firewalls for all districts
- Cache engines at all schools having a minimum of 25 networkable computers
- Unmanaged 10/100 auto sensing switches at all locations
- All computers in each school on a LAN
- All School LANs in a district aggregated on a District-wide WAN
- Connection to the internet via the district aggregation point with broadband potential
- Availability of an Application Service Provider (ASP) educational content and productivity software, with updates and support through June 30, 2005
- 3 years of remote network monitoring
- Remote and onsite maintenance
- Technical training and professional development to support the Networking and Internet Connectivity Project

In summary, each District will have, at minimum, networking to each and every networkable computer both in instructional areas, and any other non-instructional areas such as administrative offices, all the switches and routers needed to make it all work, caching and content engines to provide speed and breadth of curriculum material served over the internet, a content manager, ASP educational content and productivity software, updates and support through 6/30/05, 3 years of remote monitoring and on site service for the network, technical support 24/7, and a firewall and filtering software if needed."

[-- SFB FAQ #66]

A school internet connectivity model network illustration appeared in an SFB "Wiring The State" presentation (5/2/02): <http://www.sfb.state.az.us/sfb/sfbdoc/tech/wiringthestate.ppt>

Qwest internet connectivity specifications from its Design Document (sections 4.1 and 4.4) are paraphrased below:

- *District schools will connect to the internet via a District Aggregation Point (DAP). Connections may include any of the following, but are not limited to: Private Line Transport (56Kbps, DDS, 1.54Mbps T-1, 45Mbps T3, etc.), Frame Relay, ATM, ISDN, xDSL, VSAT, and wireless. Limited access may require the use of wireless connections in some areas. Wherever multiple options exist, the least expensive/highest bandwidth installation will be offered.*
- *Qwest design and implementation efforts will target a MINIMUM of a T-1 connection to each school even if the District may not be able to afford a T-1 connection at the time of implementation. This requirement was a specification of the SFB to provide a migration capability so that each school will be able to upgrade to a circuit capable of delivering the services that the ASP will provide...*

On May 17, 2002, Qwest informed the SFB that it would not begin work on any new projects. As reported in a June 13, 2003 special audit report by the State of Arizona Office of the Auditor General to the Joint Legislative Audit Committee:



Qwest stated that finishing the projects it had already started would require it to exceed the original \$100 million purchase order. Qwest also informed the Board that current work on the projects would continue until the specific phase of work was completed, but that the next phase would not begin. On May 23, 2002 Qwest informed the board that it would need an additional \$80 million to finish wiring all school facilities in Arizona for internet connectivity. Qwest reports that as of June 11, 2002, 525 facilities had been completely wired, wiring was in process at 329 facilities, and Qwest has yet to begin wiring at approximately 628 facilities.

On August 1, 2002 SFB announced an agreement to modify the original agreement from a \$100 million purchase order to a lump sum contract for \$140,768,00 (modification of State of AZ P.O. E01SF221; September 20, 2002). Modifications to the original agreement included removal of Qwest's requirement to provide on-site equipment maintenance and other network management and maintenance services. Completed sites already receiving these services were notified that the services would be discontinued effective August 31, 2002.

The new completion date for the modified Statement of Work was June 30, 2003.

Important Note: The Students FIRST technology initiative has been tainted by news of Qwest's SEC fraud indictment related to how early equipment purchases were prematurely booked as completed sales, by the news that Qwest was unable to complete the project at the originally contracted \$100 million dollar price, and by questions of the contracting process, allegations of conflict of interest by the SFB's original Executive Director, and other, minor criticisms. However, the resources made available in the program to create district-wide WANs and other portions of the effort provided some advanced technology advantages to districts that may not have occurred otherwise.

Also note that only public school districts were eligible for SFB technology project participation. Charter and other private schools were not. This exclusion was addressed in an answer in the SFB FAQ:

Charter Schools are established in Arizona pursuant to ARS 15-181(A) which states "Charter schools may be established pursuant to this article to provide a learning environment that will improve pupil achievement. Charter schools provide additional academic choices for parents and pupils. Charter schools may consist of new schools or all or any portion of an existing school. Charter schools are public schools that serve as alternatives to traditional public schools and CHARTER SCHOOLS ARE NOT SUBJECT TO THE REQUIREMENTS OF ARTICLE XI, SECTION 1, CONSTITUTION OF ARIZONA, OR CHAPTER 16 OF THIS ARTICLE." Chapter 16 is the section of ARS that describes Students FIRST. Thus, Charter Schools were specifically omitted from Students FIRST by Statute. [SFB FAQ# 98]

Districts that already have a network that is functionally equal to the SFB model or that has been recently upgraded at district expense and happens to meet the SFB network connectivity requirements will be considered complete and compliant and will not receive additional SFB



funding, or will receive funding only for work necessary to meet all requirements of SFB's standards.

No Summary Data Available.

Despite repeated requests, neither Qwest nor the Schools Facilities Board were able to identify which districts received full or partial implementations, nor were they able to provide any summary descriptions of the work or evaluation materials to this report. Therefore, it is impossible to determine a dollar amount for the total investment from the SFB technology initiative in Yuma County.

Each district recently received a CD-ROM from the SFB containing "As Built" data for their implementation. The CTA project consultants requested copies of the Statement of Work and network diagrams from these "As Built" records for all districts in the County. These documents describe the initial design for the districts and may not accurately reflect what was eventually implemented. The public information request to the SFB that will provide these documents is currently in process. These documents will be included in the Education Appendix of the final report.

SFB Application Service Provider component

The third element in the SFB technology initiative is providing a common, centralized application service provider (ASP). In August 2001, the board awarded a contract to Cox Business Services, which formed Cox Education Network. The following is an illustrated outline of the ASP technical structure:

[-- image from SFB FAQ at
http://www.sfb.state.az.us/sfb/sfbMain/cont_faq_faqSection.asp?secl=7]

A recent screen capture of the COX Education Network web site:

<http://www.coxednet.org/index.asp>

An SFB fact sheet describes the Cox Education Network ASP offering:

"...The network will provide the industry's most expansive collection of educational tools and resources for teachers and students throughout Arizona. The ASP will enable schools to access productivity software, over 250 educational titles, and communications software. These resources will be available over the internet and can be accessed by students, teachers, and parents from school and from home – anytime, night or day. An additional 7,000 educational titles will be available for purchase by districts at discounted rates. The ASP will host school and teacher websites, e-mail services for staff and students, portfolio storage for student work, and support services to all schools and students. Additionally, the project provides for professional teacher training by ASSET, 20 Cisco Academies, and multiple Microsoft-Authorized Academic Training Programs to



be placed throughout the state. All schools will have access to the ASP by summer, 2002; service, warranty, and free access to the ASP are included until June 30, 2005.

The ASP cost the state roughly \$28 million (approximately \$8 per student per year, until 2005) School districts are not required to use the Cox Education Network service, and, if they do use it, they would have to pick up its cost on an individual basis after 2005. Cox Education Network is a content service and is not be eligible for e-rate cost subsidy.

In an August 25, 2003, press release, Cox reported that over 700,000 subscribers, including students, teachers, and administrators are logging onto the Cox Education Network (CEN) annually. In response to a request for information about the users of CEN in Yuma County, a CEN representative identified the Gadsden USD in San Luis as the heaviest user of CEN in the county. Other Yuma County CEN users were:

- Antelope UHSD
- Crane Elem SD
- Hyder Elem SD
- Mohawk Valley SD
- Somerton SD
- Wellton Elem SD
- Yuma Elem SD
- Yuma Union HSD

CEN did not make available more detailed information about usage. They recommended contacting the person who handles the CEN desktop for each district for additional information about use and performance within districts.

ASSET (Arizona School Services Through Educational Technology)

ASSET is the professional development service that is a component of the SFB ASP offering. The ASSET website includes the following description "About ASSET":

ASSET Education Portal

The ASSET Education Portal was launched in May 2002 and was designed to offer educators a wealth of professional development opportunities and curriculum resources.

All of the ASSET resources currently available online are only found through the Portal. Educators will need to register with the ASSET Education Portal to take part in the online registration process for Self-Paced, Classroom Connect's Connected University, and PBS TeacherLine courses. ASSET members also gain personalized access to curriculum resources, such as United Streaming, by registering on the portal website.



<http://www.asset.asu.edu/>

Advanced, bandwidth-hungry application resources such as ASSET are one reason why Yuma schools may need to look beyond district T-1 connectivity.

Student education and teaching staff support, however, are not the only reasons high-bandwidth connectivity will continue to grow. School district internet connectivity also supports administrative data reporting that provides more real-time decision-making information for state school finance and policy issues. This is accomplished via a system called the **Student Accountability Information System** or **SAIS**.

SAIS (**S**tudent **A**ccountability **I**nformation **S**ystem)

In the Summer, 2002, issue of Spectrum: The Journal of State Government, Hayford Gyampoh, director of MIS and CIO for the Arizona Department of Education, described the Student Accountability Information System:

Arizona's Student Accountability Information System interconnects Arizona's schools and Education Department through the internet. Electronic collection of student detail and school financial information reduces costs and paperwork and facilitates state and federal reporting. Online analysis supports education decisions.

School districts, including both traditional schools and charter schools, are connected to the Arizona Education Department through the Student Accountability Information System (**SAIS**). Timely school financial information is collected rapidly and accurately and is stored in the department's data warehouse. Electronic data collection is already bringing about reduced costs and paperwork in Arizona. Real-time detailed information is now available to be aggregated to satisfy a variety of state and federal reporting requirements, and can be used by educators, legislators and the public for driving policy decisions about education.

This is one area of network use that has deadline driven reporting requirements for administrators in all Yuma County schools.

Shared Resources / Infrastructure

There are a number of shared resources serving library and educational users in Yuma County. The AWC/NAU-Yuma Academic Library is a shared resource. The T-1 link from AWC to Antelope Union High School is a resource shared by both APSCC (school for internet access; NAU is the provider) and AWC/NAU-Yuma (for its ITV uses). AWC/NAU-Yuma also either maintains its own ITV classrooms or uses regular classrooms for course offerings at San Luis Middle School (AWC classroom), Somerton Middle School (AWC classroom), Antelope Union High School (mentioned above), and Dateland elementary school.



Other Network Initiatives

CyberSchool Movement – Three traditional school districts won approval this year to start offering CyberSchool services using the internet: Peoria, Tempe Union, and Tucson. There are openings for two more district-run schools to participate in an Arizona pilot program to see how well cyberschools teach children. Peoria and Tucson reportedly plan to begin enrolling students in cybercourses this year. Tempe Union will be taking this school year to plan a virtual high school that is slated to open next year. These three school districts, new to cyberschooling, join Deer Valley and Mesa, districts that have been operating cyberschools for four years. There are also seven charter cyberschools operating in the state.

No school district in Yuma County provides cyberschool programs. For more information on cyberschool programs see the Distance Learning section of our final report.

Findings

The following observations are based on information collected in a variety of ways, including personal interviews, phone interviews, faxed survey forms, e-mail queries, and examination of the public record of e-rate application/commitments and as-built records at the Arizona Schools Facility Board.

The quality and detail of the responses gathered varied with the job title of the person responding. School Technology Coordinators/Directors provided technical and usage details that Principals, Superintendents, and Business Managers typically might not. Administrators provided operational and cost concern commentary that Technology Coordinators might not. An assessment of how network connections performed in terms of classroom and curriculum integration of online applications in surveyed schools is outside the scope of this report.

Connectivity and Issues

There are three major network aggregation "players" in the education community of Yuma County: AWC/NAU-Yuma, the Yuma Educational Consortium, and the Arizona Public Schools Computer Consortium. There is overlap (and in at least one case, sharing) among services at some districts. Briefly, here is what each does:

- **AWC/NAU-Yuma** integrates two- and four-year higher education offerings, as well as selected offerings from ASU and University of Arizona. It also extends its degree programs, lifelong learning, and professional education offerings to multiple sites in area population centers, including several K-12 school sites, a remote campus (in La Paz County), and a Career education center (in Yuma).
- **The Yuma Educational Consortium (YEC)** is a cooperative effort of the Yuma Elementary School District, Yuma Union High School District, Arizona Western College, and Northern Arizona University, to combine and share programs, resources, services, and personnel. Its consortium services include Computing, IT, and telecommunications;



transportation; wastewater treatment / irrigation; security; grounds maintenance; health insurance; libraries/media center; and property management. In practice, the telecommunications efforts of the YEC link more than 40 sites (K-12, administration and Libraries) and AWC/NAU Yuma telecommunications is linked to, but separate.

- **The Arizona Public Schools Computer Consortium**, based in Flagstaff, is a statewide cooperative venture of member school districts in Arizona, authorized by a cooperative purchasing agreement among public school districts, county school superintendents, and Northern Arizona University. APSCC offers a combination of financial, student information, network and internet services to its participating members. Recent APSCC participants in Yuma County include: Hyder Elementary District; Gadsden Elementary District; Mohawk Valley Elementary District; Antelope Union High School District; Wellton Elementary District; Crane Elementary District; Yuma County Schools office; and the Yuma County School Superintendent's Coop.

School districts in Yuma County show the ubiquity of T-1 connectivity. However, the issue of how to move beyond T-1 connectivity opens questions of dark or lit fiber access, gigabit Ethernet connectivity, licensed microwave wireless solutions, and ATM connectivity. The twin issues of the future of bandwidth for educational users in Yuma County are 1) is there some way to obtain better commodity pricing of aggregated internet connectivity, and 2) are there practical means to move beyond the limitations of multiple T-1 connectivity towards a wider area Gigabit WAN Ethernet or to other forms of vendor-supplied multi-megabit connectivity.

The Students FIRST networking project has implemented district-wide WANs, with school LANs that are supposed to be capable of 100 Mb Ethernet speeds. The District WANS are also supposed to be capable of upgrading to Gigabit Ethernet connectivity. Each district WAN should have a centralized network connectivity point, called a District Aggregation Point or DAP. Details regarding DAP design for each school district have been requested via a public information request from the Arizona Schools Facilities Board, but have not been received as of the preparation of this report.

The predominant technology is frame relay, although ATM is reported to be recently disclosed (by Qwest) as available in Yuma. No respondents to this survey identified ATM as their connection type. The YEC reports that it will be purchasing an additional DS-3 in the coming year and upgrading its final internet connectivity from 8 T-1s (12 Mb). This increase may be contingent on additional participants switching their internet connectivity to YEC.

The Yuma Educational Consortium (YEC)

The Yuma Educational Consortium is a local resource sharing initiative formed in 1991 to provide economical combined services for Yuma Union High School District #70, Yuma Elementary School District #1, Arizona Western College and Northern Arizona, Yuma Campus.

YEC's success with a number of categories of shared services make it a model for "best practice" activity if shared services across multiple districts become more widely implemented.



YEC Consortia include a Computer Consortium, a Transportation Consortium, a Wastewater Treatment Consortium/Irrigation Consortium, a Telecommunications Consortium, a Security Consortium, a Grounds Maintenance Consortium, a Health Insurance Consortium, a Community Library and Media Center, a Property Management Consortium, and even a "Strings Consortium" -- a combined effort between Yuma Elementary District #1 and Yuma High School District #70 to provide instruction and equipment for an orchestra.

There is political pressure to reduce the administrative costs of school districts statewide. Most recently, two Arizona lawmakers proposed consolidation of school districts into much larger districts for economies of administrative services.¹ A Goldwater Institute study² found that there would be little actual savings in the legislation proposed, and that the proposed consolidation might also jeopardize academic achievement. However, models such as YEC could be replicated and expanded across the state to achieve demonstrable efficiencies and cost savings.

YEC programs include Computer and Telecommunications consortium services. The YEC Computer Consortium provides the following combined resources:

- Aid in software evaluation
- Aid in hardware evaluation
- Aid in design of Wide Area Network (WAN)
- Service for network infrastructure
- Service for desktop computer hardware and software (Intel and Apple platforms)
- Assists technical committees in meeting goals
- Assists curriculum committees in meeting technology goals
- Serves as a single point of contact for all technology-related issues

The Computer Consortium is located in the YEC Technology Center at 596 South 4th Avenue in Yuma. It is headquarters for both the Computer Consortium and Telecommunications Consortium services of the YEC. The facility includes a thirty-seat, high technology classroom (with a **SmartBoard™** touch screen PC system, 30 networked computers for staff development/training), offices for staff, and a computer repair center staffed by certified technicians for both Intel PCs and Apple Macintosh computers.

The YEC acts as the aggregation point for a Wide Area Network (diagram on following page) which encompasses two DS-3/48 channel high speed network circuits providing 96 channels of

¹ <http://www.azstarnet.com/education/31128SCHOOLS.html>

² <http://www.goldwaterinstitute.org/article.php/403.html>



connection for:

1. accommodation Campuses: 17 elementary school, 5 public high school, one private high school, one high school, and one accommodation middle school
2. Administration: 6 high school district buildings and 4 elementary school district buildings
3. Libraries: the Yuma County/City Main library and 6 regional county branch libraries.

In addition to the County Public Library system, the Telecommunications Consortium provides service to three other locations outside the two Yuma public school districts that comprise its primary WAN: the Yuma Catholic High School, Juniper Tree Academy Charter School, and the San Luis High School. YEC has provided technology assistance to the AZ-TEC High School, donating computers and helping set them up at the site, which is a juvenile justice facility and receives its network connectivity through the (adjacent) court system. The YEC is an approved e-rate service provider for internet connectivity.

AWC/NAU-Yuma and the Consortium have some shared telecommunications links, but the higher education campus does not receive its internet connectivity through the YEC consortium. This is due, in part, to the dramatically different needs of each group's constituency such as the Child Internet Protection Act filtering required for schools and libraries receiving federal E-rate subsidy funding.

Participation in the YEC from users outside its district 70/district 1 WAN is voluntary and is market driven, *i.e.*, when YEC can demonstrate price/service advantages to users, the likelihood of participation increases. YEC has documented monthly savings, for example, of approximately \$8,000 in its initial implementation of VOIP in three high schools and three elementary schools, an annual saving of \$96,000. Some examples of other savings and operational facilitation were also identified in a recent Consortium Overview document:

Recurring personnel costs, though likely the largest single budget item, are benefited by structuring the job duties to cross over between partners. An example would be the **eSIS™** student information system support team. This team, consisting of a core of four people, maintains the data integrity for the high school and elementary districts. This commonality of effort provides expertise to deal with the constantly changing environment at the Arizona Department of Education and its reporting methodology. This core team is supported by a common Tech Support Line Maintained with three personnel serving all users within the consortium. The combination of these teams also provided the initial training to Teachers and Staff in the operation of the web-based interface of the system. ***The delivery of this initial training alone saved the districts a combined \$100,000 in services that would have been delivered by the vendor.*** Ongoing training, including annual "new teacher" training can be provided by the in-house eSIS team.



A similar scenario exists in network infrastructure design, repair and maintenance. By using a common Wide Area Network it is assured that information can flow freely between partners. Many common services are provided on the network to aid in the performance and job duties of the Consortium member's personnel. Services such as filtered internet access are provided to every classroom for use by all students and teachers. E-mail is provided to all staff and teachers to allow information exchange. Server-based programs such as *Accelerated Reader* and *Accelerated Math* are provided for use system-wide as required. The High School District provides a system-wide web based library system that allows students to browse inventory and reserve books online from any location, including home. All of these features are monitored and maintained by the Consortium staff. ***These network services alone, if provided out of house under contract, would be in excess of \$75,000 per year.***

The YEC has a support relationship with the City of Yuma, which uses the same vendor equipment and has a trained staff on site for consultation. The YEC also provides web hosting for some community organizations, including Yuma Human Services:

In other, community related areas the Consortium has provided a platform for the hosting of numerous web sites. Included in this grouping is the internet site for Yuma Human Services under the umbrella of the Yuma County Coordinating Council (YCCC). This site is an aggregation of organizations and agencies including most if not all of the not-for-profit agencies located in Yuma County and can be reached on the World Wide Web at <http://yumahumanservices.yumaed.org/> . There are in excess of one hundred agencies and organizations listed and linked on this site.

The YEC is a model of local aggregation for both technology and traditional services cost sharing. The practice allows spreading both the startup and recurring costs of services over a larger group and lowers the investment cost per student (of particular interest to smaller organizational participants). The consortium model also creates a platform for piloting (and debugging) advanced technology services (such as VOIP) and it allows the aggregate entity to purchase technology such as switches at a higher level of sophistication and capability.

The Arizona Public Schools Computer Consortium

Before there were local consortiums such as YEC, there were statewide efforts at technology assistance and facilitation. The Arizona Public Schools Computer Consortium (APSCC) is one of these, fostered by Northern Arizona University and begun in 1974. The Arizona Public Schools Computer Consortium is a cooperative comprised of member school districts in Arizona and authorized by a recently-updated cooperative purchasing agreement among its participating public school districts, county school superintendents, and Northern Arizona University.

APSCC was created with a goal of servicing the computing needs of member K-12 schools with a range of technical services, including planning, application support, and training. The APSCC



serves as problem-solving role by identifying common technology issues among its constituency and then offering services to help its members deal with them.

Member school districts pay an annual fee for the services they use. These can be a combination of financial, student information, network and internet services. Other charges might occur from the purchase of individualized packages. Fees are based on the cost of providing the services across the consortium.

APSCC offers an array of IT-related support services, including Student Information Systems, Finance and Administration Systems, and Purchasing services. APSCC also provides extensive networking and internet solutions.

For a complete description of current APSCC offerings see their 7/03 brochure in PDF form at <http://apscweb.apsc.nau.edu/services/director/APSCC%20Brochure.pdf> or visit their website <http://apscweb.apsc.nau.edu/>

Present or recent Yuma County participants in APSCC include:

SCHOOL	LOCATION	CONNECTIVITY
Hyder Elementary District	Dateland	Satellite T-1 (OptiStreams)
Gadsden Elementary District	San Luis	Multiple Frame Relay T-1s
Mohawk Valley Elementary District	Roll	Fractional Frame Relay T-1 (256K)
Antelope Union High School District	Wellton	Frame Relay T-1 (AWC/NAU split costs)
Wellton Elementary District	Wellton	Wireless T-1+ (?) previously 56k Frame Relay
Crane Elementary District	Yuma	2 Frame Relay T-1s, one Internet link from NAU and one from Qwest
Yuma County Schools Office	Yuma	?
Yuma County School Superintendent's Coop	Yuma	1 Frame Relay T-1

Issues

Survey responses and interviews identified few issues among education networking users in Yuma Counties. All respondents report few problems with vendors, but also that vendors are not very responsive. Adelphia Communications, for example, is unresponsive to queries about the possibilities of dark fiber leasing to educational users. The Arizona Telephone Company is unresponsive to the connectivity needs of Dateland schools, and so on.

Redundancy



One school district, Crane Elementary (not a participant in the YEC Telecommunications Consortium), has implemented dual network connectivity to provide redundancy of service. It has two T-1s, each going to a separate vendor, with a failover system in case one or the other of the links goes down.

Redundancy is the missing element in most of the reliability problems noted above. In many communities there is only one provider of network connectivity or the multiple providers are re-selling the incumbent telco's infrastructure, so that it is a single connection which may fail. In more developed areas, multiple vendors or multiple connectivity methods (both fiber optic and wireless, for example) can provide some measure of redundancy for organizations that can afford multiple connections or redundant technology investment. This requires the technical capability to build and maintain a fail-over system that can automatically switch their connection when one provider goes down. A statewide effort could design and recommend a cost-effective, "best practice" methodology for smaller districts for this purpose.

Summary

Over all, schools in Yuma County are unusually well positioned for aggregated connectivity. Currently most achieve this through the Yuma Educational Consortium. The next step will be to develop affordable strategies for multi-megabit access for district sites, in particular, sites in eastern Yuma County such as Dateland, which have connectivity limitations. A final step will be determining the governance or process issues that will allow the three education networking organizations active in the county to find a common ground for increased sharing of network resources and better aggregating their purchasing power for their upstream internet connection.

Higher Education

In common with other states, Arizona's internet infrastructure has its origins in higher education research projects and early experiments in extending network access to off-campus and rural sites in the state. These very early efforts grew into a network project named The Arizona State Public Information Network (ASPIN) for internet access. There was a similar development effort, centered at Northern Arizona University, which resulted in a statewide ITV network called NAUNet (see the Distance Learning section of this report for more information about NAUNet). The following paragraphs (from three sources) briefly describe the origins and purpose of ASPIN:

...Since its 1987 inception, the Arizona State Public Information Network (ASPIN) coalition has been pivotal in the establishment of state networking resources. ASPIN garnered funding and established Arizona's first connections to what has become the internet. The ASPIN coalition extended this connectivity from the Universities, to the rural community colleges, and on to K-12, while building partnerships between University researchers, and the Arizona community. Currently, ASPIN maintains a close relationship with K-12 schools, state and local government, the legislature, the business community, and Arizona's universities to facilitate the development of mutually beneficial collaborations. By utilizing these strong relationships established under ASPIN, a diverse community of interests unites and combines resources with the K-12 education community to initiate and implement field-based, community-driven projects.



[-- from "About Us" at the still extant ASPIN website:

<http://aspin.asu.edu/about/> the page includes a link to a 17 minute RealVideo clip about ASPIN.]

...ASPIN, led by Arizona State University in collaboration with the University of Arizona and Northern Arizona University, provided the first successful linkage and interconnecting of multiple universities, community colleges, agencies of city, county, and state government, plus several high tech industrial sites in Arizona (i.e., Motorola, Intel, etc.). Completed in 1991, phase one of ASPIN resulted in a computer network interconnecting the cities of Flagstaff, Phoenix, and Tucson. <http://aspin.asu.edu/vbns/ASUNet/Content/tasunt.html>

...Arizona State Public Information Network (ASPIN), based at ASU, assists Arizona's public organizations and communities in connecting to the internet. Phase I connected the three primary urban areas of Flagstaff, Phoenix, and Tucson with a state-wide backbone and within these urban areas they have provided connections to many organizations (over 50 in Phoenix). Phase II, aided by NSF funding, extended the backbone out to the state's eight rural community colleges and from there into their communities. Phase III is a proposed plan to connect Arizona's K-12 schools to the backbone developing a robust educational network. ASPIN also staffs and supports three state-wide Network Information Centers (NICs) providing a one-stop ready reference point and help desk for internet users. <http://www.researchedge.com/uss/note.html>

A fall, 1997 diagram shows connectivity detail for sites linking to the internet via ASU: <http://aspin.asu.edu/vbns/ASUNet/Content/dstate.html>. Of Yuma County sites only Antelope High School (Wellton), Somerton High School, University of Arizona, Ag in Yuma, and Arizona Western College are listed. University internet access provision in the state was segmented by campus geographic region: NAU provided services in Northern Arizona, ASU in central and south-central Arizona, and University of Arizona in Tucson provided service in south-east Arizona.

The rise and boom of the internet in the mid-1990's and the commercialization of internet service provision, plus state rules that limit competition with commercial businesses, caused the ASPIN statewide network concept to change to a more conservative provision of services. All three campuses now provide internet access only to university-research linked sites (typically via grant funded research programs generated by the various university departments), program operational sites such as state Cooperative Education offices and a remote weather sensing network, and a handful of other sites that continue their ASPIN-era connectivity relationships.

According to a representative of ASU's Data Communication Operations department, ASU internet service provision has dwindled from approximately 90 off-campus sites three years ago to just 16 as of summer, 2003.

The University of Arizona also provides internet access to the following Agriculture Network sites:

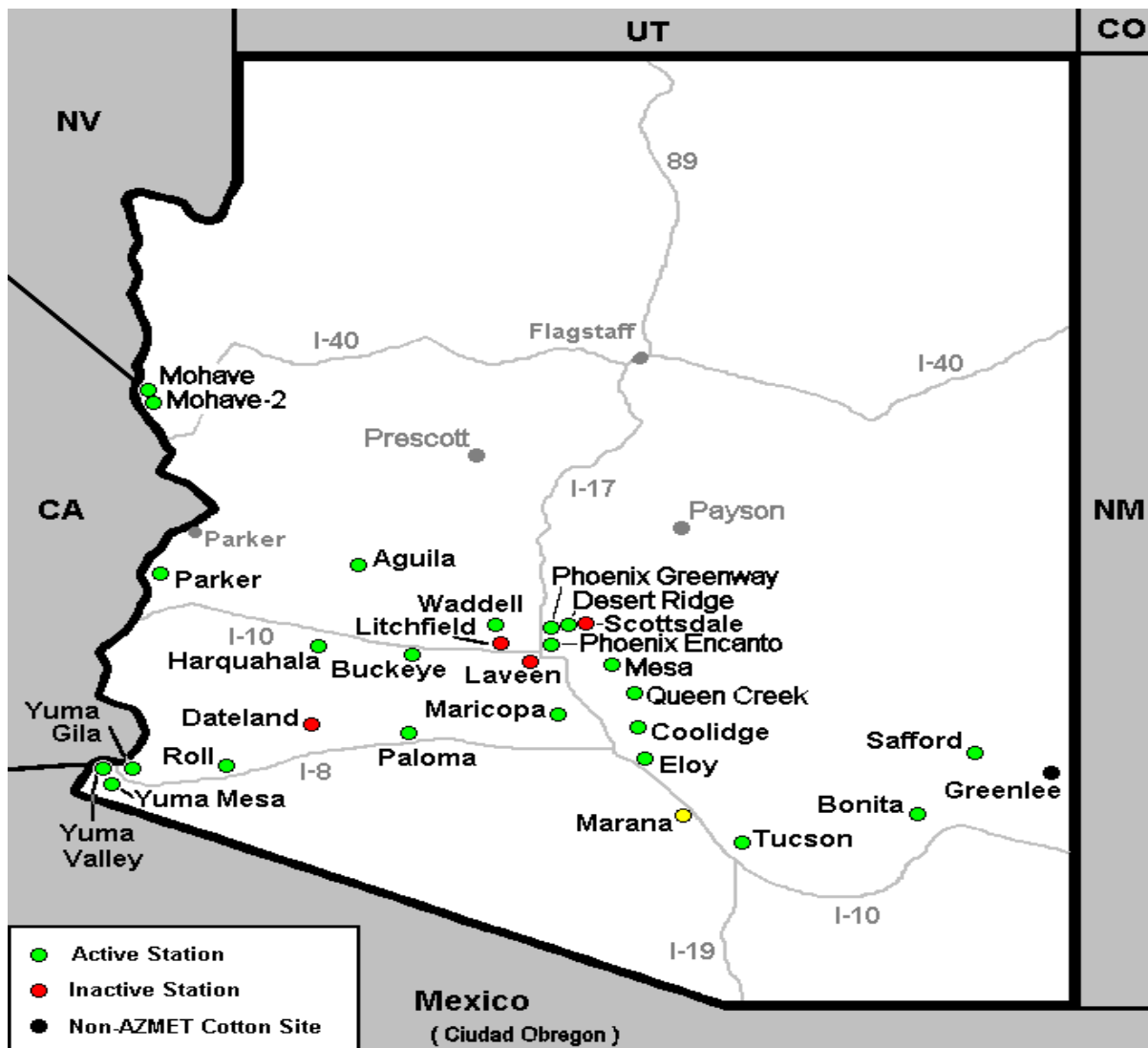
CALSNET, College of Agriculture and Life Sciences Network, University of Arizona
Yuma County connections:

UNIT	LOCATION	LINK METHOD
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Yuma County	2200 W. 28th, Yuma	T-1 Wireless/Beamspeed
Yuma Mesa Ag Center	RR1, Box 40M, Somerton	T-1 Wireless/Beamspeed
Yuma Valley Ag Center	6425 W. 8th St., Yuma	T-1 Wireless/Beamspeed

AZMET: The Arizona Meteorological Network





AZMET is a service of the University of Arizona Cooperative Extension program. The following information about AZMET is from a description on the AZMET Website (<http://ag.arizona.edu/azmet/>):

The Arizona Meteorological Network (AZMET) provides meteorological data and weather-based information to agricultural and horticultural interests operating in southern and central Arizona. Meteorological data is collected from a network of automated weather stations located in both rural and urban production settings. Meteorological data collected by AZMET include temperature (air and soil), humidity, solar radiation, wind (speed and direction), and precipitation. AZMET also provides a variety of computed variables, including heat units (degree-days), chill hours, and reference crop evapotranspiration (ET_o). AZMET data are summarized in a variety of formats, including several ready-to-use summaries that use English units, and comma-delimited ASCII text files that can be imported into most database and spreadsheet programs. Special reports generated by AZMET include the Phoenix Area Turf Water Use Report and Weekly Cotton Advisories (generated Mondays from February through August). AZMET began operating on Jan 1 1987.

Arizona Western College / NAU - Yuma

Arizona Western College was the first community college established under the Arizona Community College Law of 1960. In 1961 an overwhelming majority of the electorate of Yuma County approved the establishment of a community college district. The College became the first Institution of higher education established in Arizona since 1921, enrolling its first students in the fall of 1963.

The College District encompasses 10,000 square miles, the size of the original Yuma County; however, in 1983 northern Yuma County voted to form its own county, creating La Paz County. Thus, the college now serves two counties with a population close to 200,000.

In 1988, Northern Arizona University and Arizona Western College entered into a collaborative agreement to bring comprehensive post-secondary education to southwest Arizona. Students throughout the area have benefited from the opportunity to attain associate, baccalaureate, and masters' degrees at the AWC campus near Yuma. The two schools share classrooms, library resources and faculty members to provide a variety of services to students enrolled in both institutions. In 1996, the University of Arizona, Arizona Western College, and Northern Arizona University began a cooperative baccalaureate degree in Agricultural Systems Management.

Arizona Western College and Northern Arizona University – Yuma share a campus and provide what has been called a 2 plus 2 higher education opportunity. Students can complete a two year degree at AWC or complete the first two years of a four-year program at AWC and then, on the same campus, progress to junior and senior years and completion of a four year degree under the auspices of NAU-Yuma on the same physical campus.



AWC/NAU-Yuma offers a mix of educational, career, and lifelong learning programs on their Yuma campus, via internet-based programs, mixed media courses (cable/internet), cable telecourses, and via classroom and ITV distance learning at several sites in Yuma County and at the AWC facility at Parker in La Paz County. These locations include The AWC Career Center (1351 S. Redondo Center Dr., Yuma; <http://www.awccareercenter.org/>); Dateland School; Antelope High School (Wellton); Somerton Middle School; San Luis Middle School. There is a T-1 link to Fire Station #5, adjacent to the AWC/NAU-Yuma campus for training and course delivery there. AWC provides some classes at community locations such as the Quartzsite Library in La Paz County.

The AWC/NAU-Yuma campus gets its internet connectivity via a 3 Mbps connection (dual T-1 Frame Relay) to Northern Arizona University. The campus has T-1 point-to-point links to the AWC Career Center, Fire Station #5, the San Luis Middle School, and Somerton Middle School. AWC/NAU-Yuma shares a T-1 link to Antelope High School in Wellton with the Arizona Public Schools Computer Consortium (APSCC), a K-12 buying cooperative that administers a cooperative purchasing agreement among public school districts, county school superintendents, and Northern Arizona University. Classes offered at the Dateland school do not use ITV or the school's satellite internet connection. AWC maintains a microwave-based WAN connection (768 Kbps) to its Parker campus in La Paz County. A gigabit fiber optic network links buildings on the main campus of AWC/NAU-Yuma.

In September of 2003, AWC announced that the college had won \$5.3 million in individual and cooperative Title V grant funding. Among other uses, the grant funds will support the expansion of internet delivered educational programs and an upgrading of the school's distance learning infrastructure:

Arizona Western College Awarded Over \$5 Million in Grants

Yuma, Arizona – Sep 15, 2003 -- Arizona Western College has been awarded over \$5.3 million for two grants from the U.S. Department of Education. The title of the grants, Strengthening Hispanic-serving Institutions, falls under Title V of the Higher Education Act. Both grants will focus on increasing retention and completion rates for underserved and low-income student populations. The individual grant, just over \$2 million, hopes to accomplish this by developing several accelerated degree programs that incorporate a competency-based approach that uses distance learning strategies in order to overcome location barriers and time constraints. AWC also plans to incorporate faculty and staff development to encourage a culturally sensitive classroom environment. The cooperative grant awarded to the partnership of Northern Arizona University-Yuma and AWC was awarded over \$3 million and will specifically focus on providing significant resources to develop the distance-learning infrastructure for both schools.

[-- From a release posted on the News section of the AWC website:

<http://www.azwestern.edu/news>]



The Yuma County Library District (YCLD) aggregates the connectivity of seven locations (Main Library, Foothills – Yuma, Dateland, Roll, Somerton, San Luis, and Wellton) into a single connection to the Yuma Educational Consortium for internet access. The Library District uses a centralized catalog system (SIRSI) that depends on sufficient bandwidth and reliable internet connectivity for everyday operations. Yuma High School libraries and Arizona Western College library also use online catalog systems from the same vendor as YCLD – SIRSI. This makes it easier for libraries to deliver combined searching capabilities from their systems. Patrons at all branches of the Yuma County Library District can search in their library or home for holdings at the following sites:

Academic library, Arizona Western College
 Dateland
 Foothills Branch
 Hyder School District
 La Paz Campus at Parker, AWC
 Main Yuma Library
 Mohawk Valley School Library
 Roll Branch Library
 San Luis Branch
 Wellton Branch
 Somerton Branch

Patrons can access their accounts, place holds, suggest new purchases, renew items, request interlibrary loans, and more, all online at <http://yumalibrary.org/>. The library also subscribes to a number of databases that are available within the libraries and online:

- [INFOTRAC DATABASES](#): (requires library card number)
 Databases are: Custom Newspapers, General Reference, Health and Wellness Resource Center, Literature Resource Center, Business and Company Resource Center, InfoTrac OneFile, Opposing Viewpoints, Biography Resource Center, Informe, and What Do I Read Next.
- [INFOTRAC DATABASES in Spanish](#): Custom Newspapers, InfoTrac One File, and Informe are available in Spanish.
- [PROQUEST DATABASES](#): (login required).
 A Business and Trade database.
- [AUTHORS 4 TEENS](#): Information on authors and books suited for teens
- [CHILTON'S AUTO REPAIR](#): (requires library card number) Auto repair information.
- [ARIZONA HEALTH INFORMATION](#): State and local health portal to access local, state, and national information on individual, clinical, and community health related topics.



In most communities, the local library branch may be the only public site that provides free internet access. In practice, there is a strong demand for access to internet-linked PCs in public libraries, and libraries are seeing increasing amounts of their traffic coming from public access internet users. Students, who usually have very structured and time-limited access to the internet at their schools, can visit the library after school for additional, relatively unstructured network access (still time limited, however). Others use the terminals for e-mail, serious research, or just browsing topics of interest. Libraries typically operate formal registration processes to control access to these network-linked computers, with limitations in time and formal user agreements that attempt to control abuse of these privileges.

The downside of public access internet at public libraries is that when the public access terminals are in heavy use, staff use of administrative functions, such as catalog maintenance, may slow due to bandwidth limitations of the library connection. Also, public internet access takes up space that could otherwise be used for other, more traditional library uses, such as shelving, public meeting spaces, and quiet areas. The recent introduction of compact flat panel display screens offers the only opportunity for libraries to gain space for their otherwise crowded public access terminal areas.

In response to the CTA survey, YCLD reported satisfaction with its Yuma Educational Consortium (YEC) internet link, a high level of satisfaction with YEC technical support, and some concerns about future growth:

“At present we do not have any issues with our current providers. Not having a choice is always a concern and no competition drives the price up. We have 5 frame relay T-1 lines and pay about \$2000 per month. We always have to be concerned about network resources and do not allow our users access to audio or video or any downloads. For right now we have the speed we need, but our service is growing by leaps and bounds. We want to be able to, in the near future, tie all our locations together with voice over IP and that certainly will take up some of our resources. It would be great to have excess resources but the cost is always a concern. We get our access through the Yuma Educational Consortium and I am concerned that they be able to get what they need to provide good access for all the Yuma County schools and all the libraries.

We are a secondary tax district and we have to be very careful with our tax dollars. We do not get rate increases so each year we have to do more with less. Computer access is very important to our residents. Many families that we provide service for do not have access to computers in the home. [This] provides a demand...that we need to keep up with and try to meet. E-rate funds take the sting out of our telecom costs and allow us to bridge the gap between need and reality.”

Performance of the library network is closely monitored, and is reported to be adequate, although there are some concerns about the eventual need to grow beyond T-1 connectivity. One branch, in Dateland, appears to have some problems that may be due to latency issues of its satellite connection (an OptiStreams T-1 equivalent). Dateland is served by the Arizona



Telephone Company, a subsidiary of TDS (Telephone and Data Systems Inc.; <http://www.teldta.com/>) that reportedly declined to upgrade their local switch to digital service to provide T-1 service to local schools, necessitating their use of satellite. YCLD library locations, connectivity, costs, SLD discount rate, and number of public access terminals are shown on the following table:

SITE	CONNECTIVITY	MONTHLY COST	ANNUAL COST	E-RATE DISCOUNT (2003)	PUBLIC ACCESS TERMINALS
YCLD internet Access	T-1 (from Yuma Educational Consortium)	\$ 833.33 (cost includes a full T-1)	\$10,000	80%	
Yuma County Library District	T-1 Frame	\$ 520.77	\$ 6,250	80%	40
Main Library					
Foothills Branch (Yuma)	T-1 Frame	\$ 361.19	\$ 4,335		7
Somerton	T-1 Frame	\$ 361.19	\$ 4,335		11
San Luis	T-1 Frame	\$361.19	\$4,335		14
Wellton	T-1 Frame	\$ 361.19	\$ 4,335		23
Roll (shared public/school library)	T-1 Frame	\$ 361.19 *	\$4,335		3
Dateland (shared public/school library)	T-1 Satellite (OptiStreams)	\$1,260* (approx.)	\$ 15,120 (approx.)	90%	3
TOTAL (YCLD)		\$2,798.86	\$33,586.32	80%	101
TOTAL		\$1,600	\$19,500	90%	
(* = K-12 shared)		(approx.)	(approx.)		

In addition to the expenditures listed in the table, YCLD spends approximately \$1,500 per month on long distance, cellular, and pager services.

YCLD is a component of the Yuma Educational Consortium (YEC) Community Library and Media Center, which provides a seamless interaction between local library agencies. The YEC Community Library and Media Center is comprised of the seven YCLD facilities, the Northern Arizona, Yuma Campus/Arizona Western College library (a single combined facility), and four Yuma Union High School District #70 facilities (with a web interface behind the firewall at the high school district; <http://209.180.153.10/>).

The AWC/NAU-Yuma Academic Library serves the campuses of Arizona Western College and Northern Arizona University-Yuma, including Distance Education students. The Academic Library website at <http://www.azwestern.edu/library/> also provides links to the NAU Cline library catalog and more extensive reference resources. The Academic Library Oasis online catalog search screen is identical to the YCLD search screen and includes the capability to search for holdings at the AWC La Paz Campus in Parker, north of Yuma County.

The Yuma County Library District and the Arizona Western College Library are also participants in the Arizona EDIC Program (Economic Development Information Centers), part of a statewide



program serving the business development resource needs of the community. Participating libraries maintain a core collection on economic development that includes basic information on business, economic development in Arizona, demographics, marketing, finances, and "how to" materials aimed at small business.

Yuma County Libraries received a total of \$41,068 in an E-rate telecom services and internet access subsidy for the E-rate 2003 funding cycle, year 2003 (7/1/2002 to 6/30/2003) at a discount rate of 80%. The two school districts, which provide shared library service for YCLD, received E-rate subsidies at a 90% discount level are Dateland, which received a funding commitment of approximately \$25,000, and Roll which received an E-rate funding commitment of approximately \$13,700.

There are three other "Public" libraries in the county: The Yuma County Law Library; the Arizona Historical Society Library (web pages at <http://yumalibrary.org/ahs/index.htm>); and the Marine Corps Air Station Library.

MEDICAL/HEALTH

Health care is a critically important segment of rural economies, particularly in times of economic downturn (when healthcare needs and expenditures typically rise). 1998 per capita spending on healthcare in Arizona was estimated to be \$3,100 per resident.
http://www.stopgettingsick.com/templates/news_template.cfm/5989

A more recent national estimate of total U.S. health spending (2002) is \$5,427 per capita, with government's share being \$3,245 (primarily Medicare/Medicaid).
<http://prorev.com/statshealth.htm>

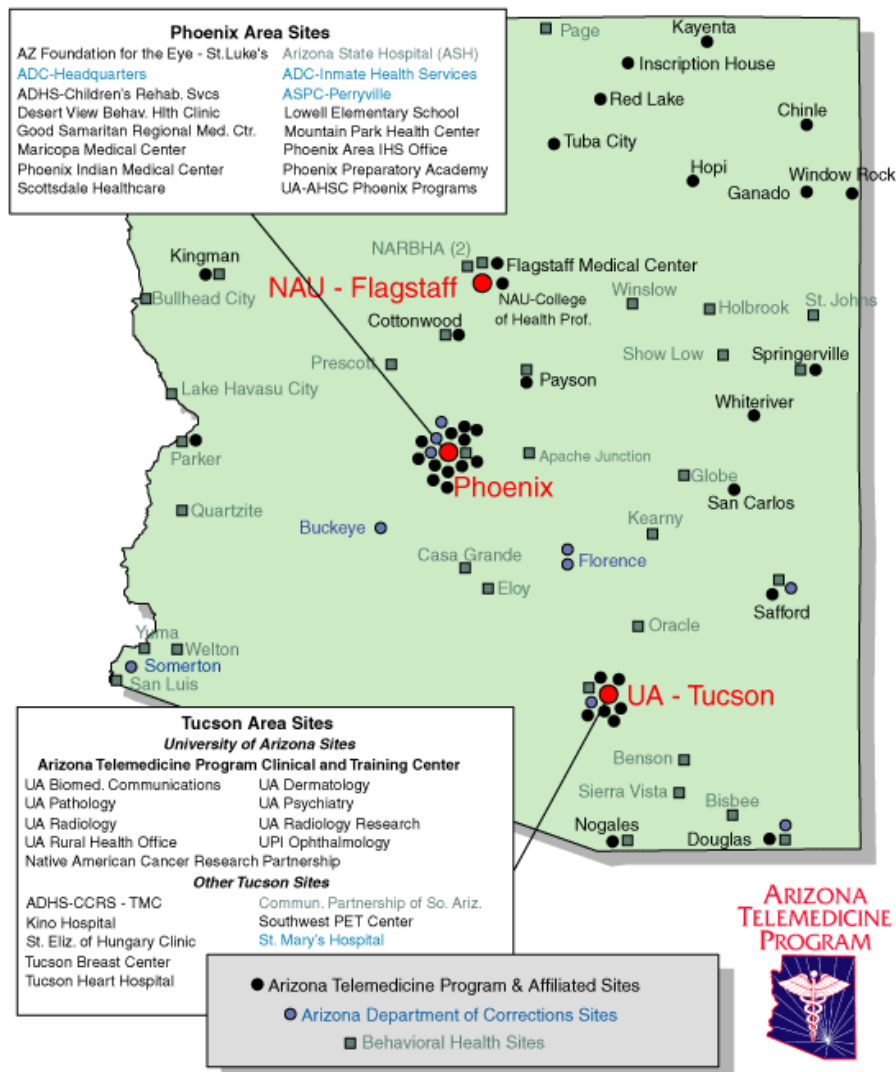
That amounts to approximately \$921 million dollars when multiplied by Yuma County's 2002 population estimate of 169,760.

The challenge to rural communities is to keep this money in the county, or in the case of Medicare/Medicaid, return this money to the county by having a robust local health care business environment that can contribute its revenue to the local economy in the form of quality jobs/salaries, supply and service purchases, and other positive benefits. According to the Colorado Rural Health Center (Snapshot of Rural Health in Colorado, 2003), health care can represent up to 20% of a rural community's employment and income, on average. Telecommunications infrastructure can help rural hospitals survive, sustain the quality and responsiveness of their services, and build revenue. And, last but not least, adequate health care services are critically important to the issue quality of life (particularly for children and seniors) and attracting new business and population growth.

Yuma County is benefited by the existence of a thriving regional medical center. Alliances with the University of Arizona Health Sciences Center in Tucson and/or Northern Arizona University could enhance development of telemedicine applications at Yuma Regional Medical Center and for specialty physicians in the Yuma area.

Telehealth/Telemedicine is an attractive benefit for improved community connectivity, but the financial model for implementing and sustaining it is weak in rural areas where population density is sparse and capital funds for investment in the equipment and circuits necessary may be better used for something else. Reimbursement issues (who will reimburse for what and at what level) and the influence of shifting business and referral network alliances for rural sites, also act to limit telehealth development.

Arizona Telemedicine Networks





AZ TeleBehavioral Health Network

Illustration here

The Arizona TeleBehavioral Health Network was developed to provide clinical behavioral health services and related activities (administrative and training/education meetings) via live, interactive videoconferencing. As Northern Arizona Regional Behavioral Health Authority (NARBHA) assisted with each Regional Behavioral Health Authority's (RBHA's) telemedicine network development, it quickly became apparent that there was a need to coordinate telemedicine efforts, at least across RBHA boundaries.

An advisory committee of the Arizona TeleBehavioral Health Network, consisting of representatives from each member agency, meets quarterly to make decisions regarding oversight, expansion, funding, future plans, legislation, public relations, network additions and deletions, changes, how those costs will be covered, and other business matters related to this effort.

In January 1996, NARBHA received funding from the Arizona Department of Health Services to develop a telemedicine system that would enhance the delivery of behavioral health services throughout 62,000 square miles of northern Arizona. The system, NARBHA net, began operation in November 1996, using dedicated T-1 lines between sites and connecting to a hub in Flagstaff.

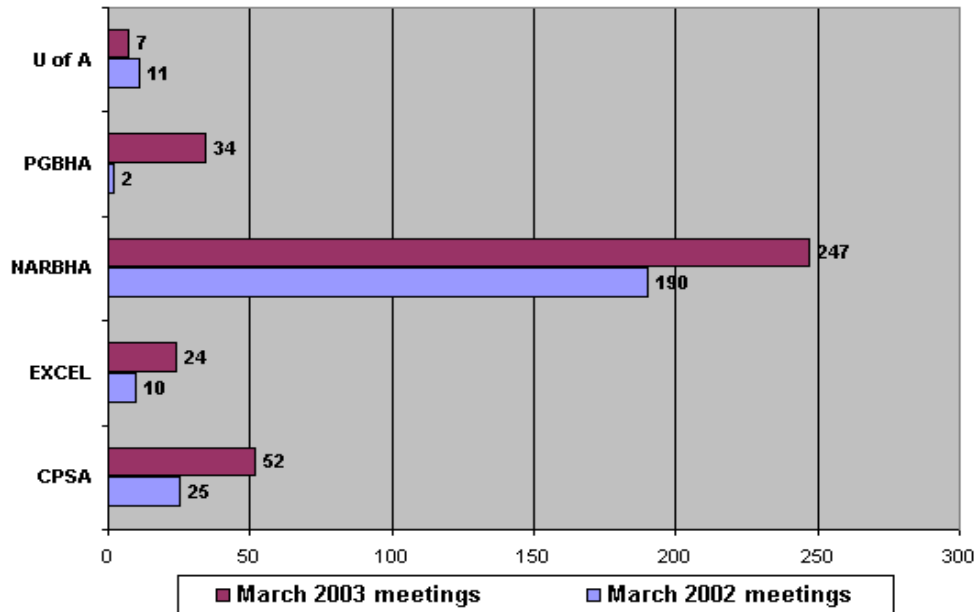
The first NARBHA sites designated for videoconferencing were Flagstaff, Show Low, St. Johns, Page, Prescott, and a site at the Arizona State Hospital (ASH) in Phoenix. Since then, two additional sites in Flagstaff, along with sites in Holbrook, Kingman, Lake Havasu City, Bullhead City, Cottonwood, Winslow, and Springerville have been added.

In mid 1998, NARBHA assisted another one of the Regional Behavioral Health Authorities, Community Partnership of Southern Arizona (CPSA), in bringing up its own multi-site network. The two RBHA networks are linked at the Division of Behavioral Health Services (DBHS) in Phoenix, providing a seamless connection between networks. In fall 1998, a third RBHA, Pinal Gila Behavioral Health Association (PGBHA), linked one site in Apache Junction to NARBHA net, becoming part of the growing statewide RBHA network.

In November 1998, NARBHA net established a permanent connection with the University of Arizona's Telemedicine Program, based in Tucson. With this connection, NARBHA has been able to offer its clinics the opportunity to participate in regularly scheduled psychiatric grand rounds and specialty physician consulting. NARBHA and the University of Arizona jointly applied for a grant for shared sites at medical facilities in Whiteriver on the Apache Indian Reservation (1999) and the new Hopi Medical Center in Polacca (2001).

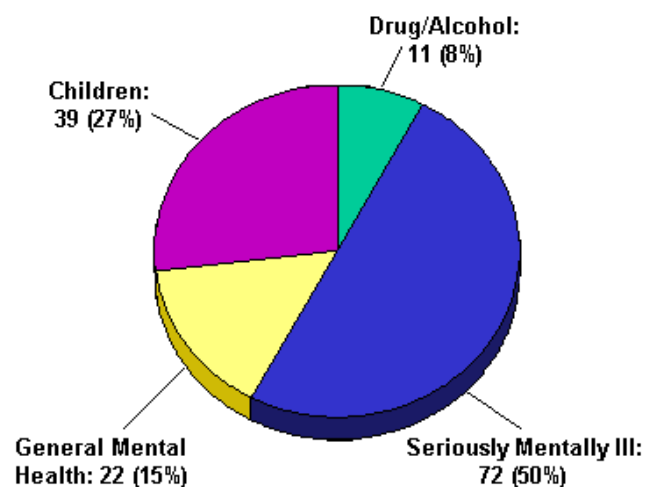


Videoconferences attended, March 2003 vs. March 2002



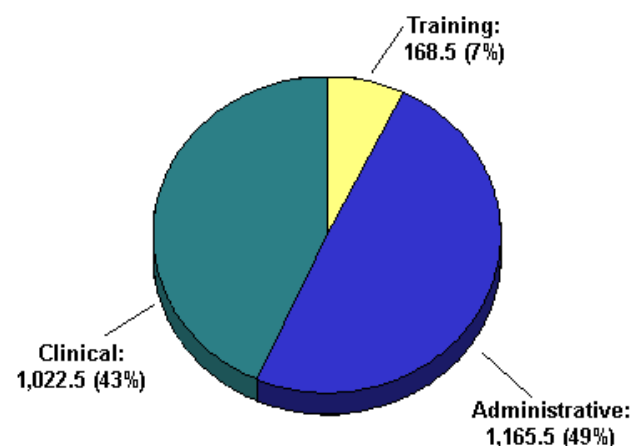
Below are NARBHAnet telemedicine statistics depicting the number of telepsychiatry members served (by program) and the types of videoconferencing activity for all NARBHA sites (Flagstaff, Winslow, Holbrook, Show Low, Page, Prescott, St. Johns, Springerville, Kingman, Bullhead City, Lake Havasu City, and Cottonwood).

NARBHA Telepsychiatry Members Served*
(by program - monthly average)
January - March 2003



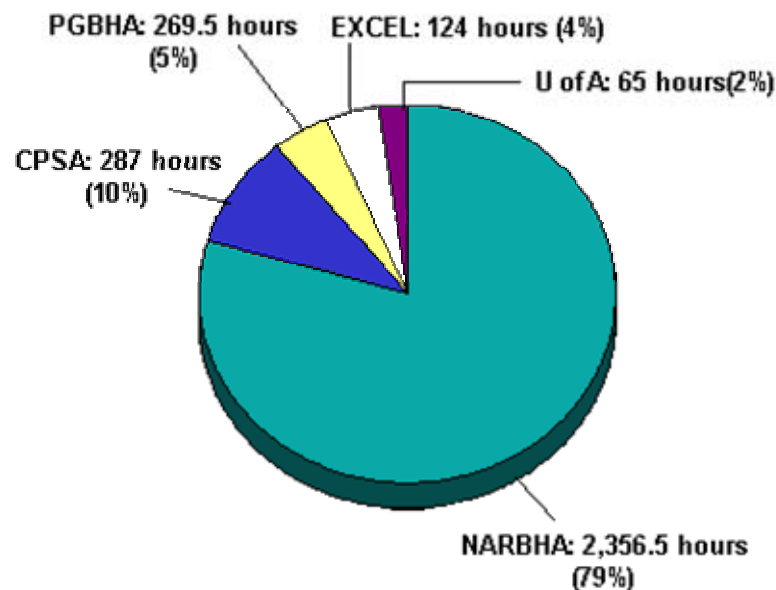
** Actual number of members served per month is higher than shown here due to lags in reporting*

NARBHA Net Videoconferencing Activity
(number of hours spent in videoconferences)
January 1, 2003 - March 31, 2003



The chart below shows use of the NARBHAnet system by all Arizona Regional Behavioral Health Authorities (RBHAs) during the period January 1, 2003, through March 31, 2003.

**Arizona RBHAs
Use of NARBHAnet
January 1, 2003 - March 31, 2003
(In Hours)**



NARBHA uses Polycom video equipment that was purchased through Wire One Technologies, Inc. The equipment is capable of delivering two-way, interactive video, videotape recordings, and computer presentations. A remote-control unit controls the equipment during use. The camera can be programmed for preset room locations, can be voice-activated, and can be controlled by remote sites (which is useful in delivering psychiatry services).

Any network site can schedule and initiate a videoconference. NARBHA also has the capability to add cascaded sites from other networks broadcasting at differing bandwidths to videoconferences held over the network, and up to four sites can be viewed at the same time with split-screen capability. The system was designed to be user-friendly and does not require technical staff at remote locations. In addition, the system was designed to be flexible, allowing all sites to participate in a single conference, or combinations of multiple conferences occurring simultaneously.

Network end-user sites are equipped with Adtran TSUs accepting the T-1 line from Flagstaff, which feeds into the router, where the T-1's 24 channels are split out for video, data, or voice. The video equipment located at the majority of the NARBHA sites is CLI Radiance 8750s and 8775s, with one VTEL TC2000 and four Polycom Viewstation FXs. These room video units are all equipped with a television monitor and a codec, which translates analog signals into digital



signals for transmission over a T-1 phone line, and back again for receiving. This allows a two-way, live interactive video transaction.

Fifteen northern Arizona sites are currently connected to NARBHA net over private, dedicated T-1 phone lines. The network also has the capacity for two primary rate interface (PRI) call connections to the outside world, and includes T-1 lines to NARBHA's partner agencies. These include one full T-1 path to the Community Partnership of Southern Arizona (CPSA) telemedicine network with multiple sites (including the Department of Behavioral Health Services); three full T-1 paths to the Apache Junction hub of the Pinal Gila Regional Behavioral Health Association (PGBHA) eight-site network; one full T-1 path to the Yuma hub of the EXCEL group six-site network; and one full T-1 connection to the University of Arizona's Arizona Telemedicine Program in Tucson.

All 15 of the NARBHA network sites are internal inverse multiplexer connection type; the U of A is a direct connection. The hub location in Flagstaff houses a N.E.T. IDNX 90 Prime Video Switching system, which allows for private video and data network connections, configured for both on- and off-network video dial-up capability. Dedicated T-1 phone lines from each of the remote site locations connect from local telecommunication carriers into the hub through Adtran TSUs, which carry those 24 channel sets into the IDNX 90, where those 24 channels are then split out, dedicating eight channels for video for each site, one D-channel, and the remaining 15 channels for data and voice applications. The eight consecutive video channels with the one D channel (for voice and video switching) are then fed into the MultiPoint Conferencing Unit (MCU) bridging device, a software-controlled switching device that interconnects H.320-compliant conferencing systems. This MCU permits all 15 sites, as well as sites on connected networks (PGBHA, EXCEL, CPSA) and up to two outside agencies (such as hospitals, universities, out-of-state agencies, or clinics) to participate in any combination of multi-site videoconferences that T-1 bandwidth allows.

<http://www.rbha.net/overview.html>

Bandwidth is important for any health care application in rural communities, but it is critically important for more advanced telehealth/telemedicine applications such as teleradiology. Here, for example, is a table of estimated transmission times for a range of connectivity bandwidths:

Time required to download a 24 megabyte file of X-ray images (from the Main Street Economist, "The Broadband Quandary in Rural America," August, 2000)	
SPEED	TIME
14.4 kbps	3.6 hours
28.8 kbps	1.8 hours
56 kbps	58 minutes
128 kbps	24 minutes
1.54 mbps (T-1)	< 3 minutes
4 mbps	48 seconds
10 mbps	< 20 seconds



As a practical matter, T-1 or fractional T-1 is the only viable bandwidth for applications which require transmission of large files. There are products and services on the teleradiology market that operate at ADSL speeds, and historically, there are some non-radiology telehealth applications, such as home monitoring of pacemaker settings, which have used devices as slow as 150 baud acoustic-coupled modems.

Hospitals

Yuma Regional Medical Center

YRMC is a sizable regional medical center which is currently undergoing expansion. This well-staffed, well-equipped medical facility is large enough to obviate the need for extensive telemedicine applications. However, the pediatricians, and especially the pediatric cardiologists, have expressed an interest in establishing a network link to the University of Arizona Health Sciences Center for diagnostic support. This link was recently effectuated to transmit echocardiography data for remote evaluation by specialists at YAHSC.

The hospital provides access via T-1 lines, to a physicians' information service. It also provides T-1 teleconferencing capability for physicians to access continuing education programs. There is not yet a similar program in place for the nursing staff although one is anticipated in the future.

The hospital owns 12 strands of fiber which run from the hospital site to its corporate administration center some distance away. The medical center also contracts with Qwest for a dedicated T-1 connection for diagnostic imaging applications at its Foothills satellite clinic and maintains a T-1 dedicated line to St. Joseph's Hospital in Phoenix for nighttime wet-read x-ray back-up. YRMC provides for ISDN connectivity for radiologists and certain other physicians to home and office locations and maintains a VPN access for medical records and case management. There is a dedicated T-1 line to the 4th Avenue Wellness Center in Yuma.

The hospital would like to provide internet VPN access for its school nurses who are located throughout the Yuma County region. The YRMC is also developing a comprehensive, interactive website for patients which will allow for virtual follow-up visits as well as billing management and access to disease management information.

The Yuma Regional Medical Center is a sophisticated consumer of technology and its current bandwidth demands, while mostly being met internally, are high and with planned expansions into the Foothills site east of Yuma, and desired additional applications, the demand is expected to grow significantly, making future demand very high.

Clinics

Sunset Community Health Center

This health center has clinic sites in San Luis, Somerton, Wellton and two sites in Yuma. The clinics provide urgent care, women's care, geriatric, chronic disease management, infant and pediatric visits, as well mental health care. The Wellton and San Luis sites provide for mental health consults via video-links using H.320 technology on the NARBHA network. Other applications are minimal, but the clinics would benefit from expanded broadband capacity,



especially for medical records management. These clinic sites are assisted by the Yuma County Medical Collaborative, an extensive partnership dedicated to ensuring access to quality medical care for the entire county.

Yuma County Medical Collaborative

The Yuma County Medical Collaborative is a multi-partner effort to provide a medical ‘safety net’ for all of Yuma County’s residents and laborers. Partners include the state and county health departments, numerous physician practices and specialty groups, mental health providers, Sunset Community Health Center and the Yuma Regional Medical Center. While the Collaborative itself does not maintain active clinic sites, it lends assistance to the Sunset Community Health Center network of rural clinics in southern Yuma County.